

February 1964

culture

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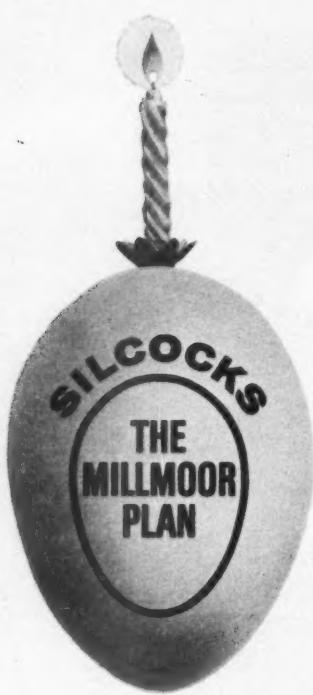
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Calf Weaning

at 3-5 weeks



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When weaning from *whole milk* at 3-5 weeks, see that they get 3 days on colostrum, then whole cows' milk at the daily rate of 8 lb milk for every 100 lb of birth weight in two feeds; offer clean water (from pails rather than bowls) and good hay. In very cold weather warm the water for the first 7-14 days after weaning.

From 10 days old give $\frac{1}{2}$ - $\frac{3}{4}$ lb concentrates daily. See that fresh quantities are always supplied, feed any uneaten residue to other stock. Carry on with milk feeding until 3-5 weeks old, then stop abruptly. At this time strong, healthy calves should be eating $\frac{1}{2}$ lb meal daily.

On the day after the calf has had its last feed of milk, increase the concentrate allowance to $1\frac{1}{2}$ lb daily. Thereafter feed to appetite until 4 lb per day is being taken, by which time the calf will be about eight weeks old.

Feed Formulation (in cwt) suggested for calves up to 8 weeks of age: Flaked maize 4, crushed oats 3, Molassine meal $1\frac{1}{2}$, Soya bean meal $\frac{1}{2}$, Fish meal 1 (=total 10 cwt), plus 7 lb mineral-vitamin supplement.

A. I. FOR PIGS

Sir John Hammond



WHEN we look at our dairy cattle today, the great majority of which are in small herds, we cannot but be impressed by the part which A.I. has played in so short a time. The position in the pig industry is much the same as that in the dairy industry pre-war, before A.I. was introduced.

The bulk of our pigs are bred in small herds which cannot afford a good progeny- or performance-tested boar, and the litters are sold at weaning to larger farmers to feed. The position differs, however, in that when A.I. in cattle was introduced there were very few progeny-tested bulls to be had, whereas larger numbers of progeny- and performance-tested boars are now becoming available. In this respect the pig industry has an advantage over the dairy industry in starting A.I.

A.I. to speed improvement

There can be no doubt that we could quickly (and 'quickly' is the important word) transform our pig industry by the widespread use of A.I., just as the dairy industry has been transformed. Since most small commercial pig breeders keep sows of their own breeding, the use by them of a progeny-tested boar will give gilts bred from him 50 per cent good blood, while another progeny-tested boar on these will give 75 per cent good blood and so on, 87½ per cent and 93½ per cent in successive generations. In pigs, generations come far quicker than in cattle.

In Denmark the boars used by commercial breeders come from 'Breeding Centre' herds, in which only progeny-tested boars and sows are kept. It is

proposed to do the same thing in Britain by the creation of 'Accredited Herds', but it will be a long time before there are sufficient of these to supply all the boars required in this country. It has taken Denmark some fifty years to get to their present position. If boars from such accredited herds could be used for A.I., improvement would be greatly speeded up here.

One other aspect of A.I. is that it helps to cut down the spread of contagious diseases. This was well demonstrated at the beginning of A.I. in cattle and it has been one of the main reasons for the rapid increase of A.I. for pigs in Holland in recent years. There, by 1962, more than 100,000 first inseminations were made with a 58.3 per cent conception rate. They have twenty-three associations with 353 boars, and average 172 litters per boar, with 10.2 pigs per litter.

Technical considerations

There are, however, a number of differences, both technical and economic, between A.I. in pigs and A.I. in cattle, which have to be considered.

For some time the conception rate in this country (i.e., the percentage of sows which conceived at the first insemination) was quite low, about 40 per cent, as compared with the present 60 per cent calving rate or 70 per cent non-return rate in cattle. This poor result in pigs was due mainly to insemination at the wrong time. In cows, the egg is shed some 14 hours after the heat period is over; in sows, the eggs are shed before the heat period ends and so if not inseminated at the right time during heat the eggs are not fertilized. But over the past two years, as the result of films made to show inseminators and pig keepers the way to judge the right time to inseminate, the conception rate has risen to about 65 per cent, rather higher than the non-return rate in cattle when insemination first began. There is plenty of evidence to show, however, that when conception does occur the number of young in the litter is normal.

Another difference is that at present boar sperm has not been regularly kept fertile so long outside the body (about 24 hours) as bull sperm in the liquid form (about 3 days), and as yet, unlike bull sperm, it cannot be preserved by deep freezing. Even so, it has been found possible to send boar sperm from Sweden to England successfully. In France, it is claimed that boar sperm can be kept alive for several days by keeping it in capsules impregnated with carbon dioxide gas. No large-scale tests of this have yet been published in this country, but preliminary trials are encouraging.

Boar semen is much greater in volume (about 200 cc) than bull semen (about 5 cc). Resulting from this, it cannot be diluted to anything like the same extent as bull semen, so that not so many sows can be inseminated from one collection, as with cows. In Holland, it has been calculated that some 2,000 sows could be inseminated from a boar in a year, but in practice it has been limited to 500 for fear of too much inbreeding. With the present limited period of storage, it would also be limited by the number of sows on heat each day. However, as boars are not so expensive as bulls, this is of minor importance economically; more boars can be kept for the same capital outlay.

Again, with cows it is only necessary to inseminate 1 cc; with sows it requires at least 30 cc because the uterus in the sow is so much longer and the contractions of the uterus which follow insemination in the sow do not

drive the sperm up to the egg quickly enough if only a small amount of fluid is injected.

Another difference between cow and sow in both natural mating and in insemination is the time taken to insert the semen; it takes much longer in the sow than in the cow.

Economic considerations

These technical differences between insemination in the sow as compared with the cow give rise to a number of economic considerations.

The chief item in the working expenses of an A.I. station consists of the cost of travel and the inseminator's time. The best commercial proposition is therefore to place the A.I. station in the centre of a thickly populated area. Since it costs more to inseminate herds far distant than near to the station, some limit must be placed on the radius. It was for this reason that sub-stations at the centre of nearby concentrations of cattle were started. With cattle, the economic limit is not more than about a 20-mile radius. Because of the greater time taken to inseminate sows than cows, and because of the often more frequent visits made by the inseminator to catch the sows at the right stage of heat, it may be found that a smaller radius is more economic for sows. But again this will depend on the density of the pig population in the area covered.

Owing to differences in the concentrations of cows and sows in various parts of the country, it follows that the present A.I. stations for cattle are not always suitably sited for pigs. On the other hand, it has been argued that mileage for the inseminator can be cut down by inseminating both cows and sows in one area. But this raises another question—whether it isn't better to have specialized inseminators for each species. The technique is quite different; the sow requires a much longer time. Moreover, the correct handling of the animal is different, and much of the efficiency of insemination depends on the proper handling of the animal.

On balance it seems better to have specialized inseminators for each species. Travelling expenses for pig inseminations could be saved by regulating the time of weaning in sows so that several come into season at one time.

The service

In addition to receiving a PIDA grant, the different pig A.I. stations charge a fee ranging from about 20s. to 40s., compared with 15s.-20s. for premium boars. When we have had more experience in the siting of stations, in the detection of the right time of heat and the possibility of using gas-stored semen, it should be possible to reduce overhead costs. The present overall conception rate in pigs is still about 60 per cent, but this varies in different localities from about 36 per cent to 75 per cent, and is higher for sows than for gilts.

When A.I. first started in cattle, the Ministry of Agriculture authorized the starting of the centres and guaranteed them against loss over a five-year period provided they complied with the regulations which an Advisory Committee of the Ministry proposed. On a different basis, the present pig A.I. service is being subsidized by PIDA. Cattle centres were started by the M.M.B. in the most thickly populated areas first, so that by the time they were making a profit they could be used to finance centres in less thickly populated areas.

The future development will depend not only on the improved techniques that should result from present research but also on the extent to which producers appreciate its value in livestock improvement. Such an effect should be quickly seen in the pig, provided top quality boars are made available by the centres. Attention is now being paid to this, for special facilities are being made available for progeny testing A.I. boars. A close link between the progeny-testing and A.I. service should be maintained.

Sir John Hammond, C.B.E., M.A., D.Sc., F.R.S., retired from Cambridge in 1954 after a long and distinguished career in agricultural research. He is still very active, as is shown by his visit to Italy last year and his present trip to Africa.

FARM BUSINESS

F. G. Sturrock and D. R. Silvey

*discuss aspects of profitable production
which are under the farmer's control*

WINTER MILK

MANY farmers must be wondering whether to concentrate on producing milk in summer when costs are low, in winter when prices are high, or to keep to a level production throughout the year. A survey carried out in Eastern England in 1961-62, and summarized in Table 1, shows that there is little difference between these three alternatives in terms of gross margin.* All give about £44 per acre. What does emerge from this result, however, is that it is not so much the season of production that matters as the methods of producing it in that season. Within each of the three groups there is a very wide range of individual results. The winter producers show gross margins from £49 to £108 per cow and £26 to £61 per acre. Clearly some herds are doing exceedingly well, whereas others are losing money; the survey shows some of the reasons for this variation.

*Gross margin is gross output minus feedingstuffs, fodder, cow replacement, veterinary charges and dairy stores but not labour, which is dealt with separately. The Gross Margin of cereals would be about £30 an acre.

Table 1. Milk Production in the Eastern Counties, 1961-62

Type of Producer	Winter Producers	Intermediate	Summer Producers
% Winter Milk	59.7	50.9	43.0
Milk Sales (£ per cow)	132.1	122.6	119.5
Variable Costs (£ per cow)			
Concentrates	35.0	28.3	31.8
Forage and grazing	9.5	9.7	8.2
Other items	7.4	6.2	5.6
Total variable costs	51.9	44.2	45.6
GROSS MARGIN PER COW (£)	80.2	78.4	73.9
Acres per cow	1.79	1.78	1.71
GROSS MARGIN PER ACRE (£)	44.8	44.0	43.2
Yield per cow (gallons)	916	860	851
Concentrates per gallon (lb)	3.21	2.76	3.00
No. of herds	24	36	11

N.B. Those herds producing at least 55% of annual total of milk over the October-March period are classified as winter producers.

Factors under farmer's control

Some factors affecting profitability, such as the price of winter milk, are a matter of Government or M.M.B. policy. But others are very much under the control of the farmer himself. Feedingstuffs are by far the biggest cost, so this is the item to which most attention should be paid.

There are many systems of feeding a dairy cow, but essentially they are all variations on two basic methods. The herd with a moderate yield can get along mainly on good quality bulky foods that are cheaper than concentrates. On the other hand, if the farmer has suitable cows and the skill to obtain high yields, he can feed them on concentrates up to the limit of their yields. The low-cost system depends on the production of really good quality bulky foods and the high-cost system on the careful rationing of concentrates.

Either can give excellent results provided it is efficiently managed. What must be avoided is the unrationed feeding of concentrates to cows that give moderate yields or an attempt to top up poor quality bulky foods with expensive concentrates.

Basic systems illustrated

The two basic systems are well illustrated by the four herds shown in Table 2. Herds A and B use large quantities of concentrates (around 5 lb a gallon in winter and 4 lb a gallon in summer), both higher than is really necessary if food is properly rationed. But the results the farmers get are very different.

The farmer of Herd B, although a little extravagant, does obtain 1,041 gallons per cow. On balance, this pays for the heavy feed bill and leaves a gross margin of £95.1 a cow, a very satisfactory result. Herd A (with a gross margin of only £58.7 a cow) shows the effect of excessive use of concentrates with only a moderate yield of milk—the fault being that rationing is not properly controlled. The whole feeding system needs to be reconsidered and the farmer should certainly test the accuracy of his concentrate dispensing apparatus. If cows are overfed, as they undoubtedly are in this case, a reduction in the amount of concentrates fed would lead at the worst only to a small reduction of milk, and the saving on the food

A high-cost system depends on careful rationing of concentrates. A low-cost system depends on really good quality bulky foods



would outweigh the loss in milk and give an increase in profit. Adjustments should, however, be made cautiously, by trial and error, with an eye on individual cases.

Herds C and D, by contrast, make more use of bulky fodder: they use less than $2\frac{1}{2}$ lb of concentrates per gallon over the whole year and hardly any in summer. Costs are low in both herds, but the receipts are very different. Herd C, with low yields (683 gallons), has a gross margin of only £63.3 a cow. Herd D, with a medium yield (851 gallons) and low costs, has a gross margin of £86.5 a cow.

Table 2. Four Dairy Herds producing Winter Milk, 1961-62

Level of Concentrate

Feeding	High				Low				Herds	High				Low			
	A	B	C	D	A	B	C	D		A	B	C	D	A	B	C	D
Milk sales (£ per cow)	124.3	148.9	98.9	125.0					Herds								
Variable Costs (£ per cow)									Acres per cow (adjusted for aftermath)								
Concentrates	45.7	49.6	17.5	21.9					Roots, kale, etc.	0.23	0.36	—	0.10				
Forage and grazing	11.1	7.7	9.3	9.2					Hay and silage	0.90	0.29	0.78	0.80				
Other items	8.8	—3.5	8.8	7.4					Grazing	1.16	0.90	1.06	0.55				
Total variable costs	65.6	53.8	35.6	38.5					Total acres	2.29	1.55	1.84	1.45				
GROSS MARGIN PER COW	58.7	95.1	63.3	86.5					Concentrates fed (lb per gallon)								
GROSS MARGIN PER ACRE (£)	25.6	61.4	34.4	59.7					Summer	4.19	3.57	0.54	1.45				
									Winter	5.27	4.99	3.50	2.88				
									Year	4.81	4.38	2.32	2.40				
									Yield per cow (gallons)	833	1,041	683	851				
									Cows per herd	37	36	58	102				
									% Winter milk	57	58	60	66				

Gross margin per acre

Gross margin per cow is one stage in assessing the efficiency of milk production, but the gross margin per acre is just as important. This applies particularly to the small farm where it is acreage, rather than a shortage of labour or capital, that limits the number of cows. The problem is less pressing on a large farm, since the operator may be prepared to accept a lower return per acre, provided there are enough acres and he does not have to pay too much for them.

The area of forage and grazing used by Herds B and D is low, at about $1\frac{1}{2}$ acres per cow. Farm C suffers from shortage of grazing due to midsummer drought and has to irrigate. Despite these difficulties acres per cow are reasonable at 1.84. Farm A also suffers from summer drought but does not irrigate. This accounts for more acres per cow being used for grazing than in the other herds, since a safety margin is required.

Gross margin per acre over these four farms shows a very wide range, due to the interaction of gross margin per cow and acres utilized per cow. Farms B and D are doing well, whereas Farms A and C are not. In fact Farm A is only just breaking even, since the fixed costs for labour and overheads are in the region of £25 per acre.

The followers

So far, emphasis has been on the dairy cows themselves, but attention must also be given to the followers. The gross margin per acre for rearing young stock is, however, only about £12 an acre, compared with £30 to £60 or more for the dairy cows alone. Thus if we include the young stock, the gross margins per acre quoted fall by £7 to £12 an acre. Most farmers prefer to rear their own heifers to avoid the introduction of disease and to preserve their own breeding strain. There is, nevertheless, a cost to be borne, and if the farmer rears too many young stock at the expense of dairy cows in milk, his profits per acre will fall. It is also obvious that on a small dairy holding, a farmer who can pick up reliable down-calving heifers at £60 to £80 would be well advised to give up rearing and leave this to others who have large areas of cheap grazing.

Full use of labour

A gross margin analysis deals with the variable costs of the enterprise, but efficient utilization of common costs is also necessary for a good profit. Labour is the most important of these and must be used to the full. Labour saved by reorganization must be usefully employed elsewhere, otherwise the farmer will gain no benefit.

Herds A and C each have a yard and parlour with self-feed silage. On Farm C, one cowman, with a little help in winter, looks after 58 cows and young stock—only 51 man-hours a cow. On Farm A, one cowman looks after 37 cows and young stock. This means 95 man-hours a cow—an extra cost of £12 a cow, compared with Farm C. Herds B and D each have two cowmen who also care for the followers. Herd D, with 102 cows, has a yard and parlour and self-feed silage—50 man-hours a cow. Herd B, by contrast, has only 36 cows; the layout is less convenient, the cows being milked in a cowshed, and they are fed on hay in place of silage. This means a total of 137 man-hours a cow—an extra cost of £20 a cow, in comparison with Herd B.

Labour-saving is thus an important item in the profitability of the dairy herd. But it is not enough merely to provide a convenient layout. If there are two cowmen and a new layout allows one man to do the work, this solves the problem. But if there is only one man, the problem is more difficult. If the farmer improves the layout, he must either give the cowman more cows or find him a part-time job elsewhere. The latter is not always easy to arrange because the cowman may not have an interest in, or aptitude for,

other stock. There is thus a growing tendency for farmers with small dairy herds and a cowman to 'double or quit', a fact confirmed by the reduction of a quarter in the number of herds under 20 cows in the past five years.

It's a highly skilled job

Quite apart from labour use, the recent pressures on margins in milk production and the fact that attractive alternative lines such as cash crops are possible, especially in the east of the country, have already induced some farmers to give up milk production. Doubts about future prospects have been raised in the minds of others.

One thing is becoming clear. With more cows per man and rising costs, milk production is getting to be a highly skilled profession. It is indeed an enterprise to take seriously or leave alone. As we have seen, the skilled cowman can produce a profit that is two or three times as high as the average. With indifferent management, the losses are equally great.

The authors of this article are both in the Farm Economics Branch of the School of Agriculture, Cambridge. F. G. Sturrock, B.Sc., M.A., is the Director of the Branch and D. R. Silvey, B.Sc., is a member of the graduate research staff, responsible for milk production costs in Eastern England.

While Assistant Agricultural Economist at Cambridge during the war, Mr. Sturrock wrote a text-book *Farm Accounting and Management*. He later spent three years doing research into the productivity of labour in farming, and went to the U.S.A. to study methods of improving labour productivity and of farm planning, before taking up his present appointment in 1951.

CORRECTION

Push-bucket Feeding

Readers of Mr. Penfold's article, 'Push-bucket Feeding', in our December issue may have been a little mystified by the figures quoted for routine feeding times. We must apologize it was not made clear that the times shown were minutes per pig, *per week*.

If it were thought that last year's hard winter might bring compensation in the form of fewer insect pests, we were sadly mistaken. The observations noted by the author over the south-east part of the country shows the resilience of insect species which farmers and growers are up against

Insect Survival over the Winter

S. W. H. Rolfe

WHEN temperatures drop below freezing point the movement of insects usually ceases. They have no means of raising their body temperatures materially above that of the air around them. Very many will pass the winter in the adult stage in a state of suspended animation but others will need to be active and to feed. The latter will suffer severely from long frosty periods. When, however, the overwintering stage is resistant, for example as eggs or pupae or some larvae, very cold winters may actually be beneficial to the insect and assist survival. Metabolism is slowed down so that the food stored in the body is not consumed before feeding needs to start again. Predators are themselves immobilized or killed. Bacterial and fungal activity are much reduced, so that insects suffer less from such diseases.

The conditions of the winter of 1962-63 demonstrated these points. Over most of England the ground surface was frozen from the third week of November to the beginning of March. Snow lay from 5th January till the end of February, with frost penetrating at least four inches into the ground. The cold weather broke suddenly at the beginning of March but was accompanied by very wet conditions. From a farmer's point of view this wet spell practically nullified the possible benefit to the soil from the winter frost. Plant growth, delayed by the cold and the sodden soil, did not begin till about mid-March.

Aphids persist

Most species of aphids can pass the winter as eggs on woody host plants. In this stage they are very resistant to low temperatures, and a high percentage survived into 1963. On apple trees the Grass-Apple Aphid and

the Permanent Apple Aphid came through in average or above average numbers. At the beginning of June carrots were heavily infested by the Carrot Willow Aphid migrating from willow trees. Normally these aphids are able to survive on overwintering umbelliferous plants from which they carry the Motley Dwarf virus to the carrots. In 1963 there were practically no signs of this disease.

The Peach Potato Aphid carries many virus diseases, especially Sugar Beet Yellows. Besides the egg stage on peach, many of these aphids usually spend the winter on herbaceous plants of various kinds, including sugar beet stocklings and mangolds in clamps, from which they pick up the virus. In 1963 these hosts were much reduced, as were the aphids upon them and the aphids did not appear on sugar beet until the end of June.

The Black Bean Aphid spends the winter as eggs on Spindle bushes. Large numbers were laid in 1962, and though in some areas a proportion may have died, enough survived in the south of England to give rise to big migrations to beans and consequent heavy infestations in May and June. The Leaf Curling Plum Aphid is unusual in that the eggs which are laid on plum, etc., normally hatch in December. Infestations were negligible in 1963. This may have helped the Hop Damson Aphid to build up its spring population so that huge numbers migrated to hops in early June.

Aphid predators such as ladybirds and hover-flies were rather scarce at the beginning of the summer, but by the end of September aphid colonies of all kinds were suffering heavy attacks from Chalcid wasp parasites which had built up to very high numbers.

The flies get through

The majority of true flies pass the winter in an immature stage. The Wheat Bulb Fly lays its eggs on rough, bare soil in August, and these do not hatch until the end of February, when the young larvae search for and enter the shoots of suitable grasses or wheat. Populations of the eggs of this pest were reported to be about normal in the autumn of 1962, with high numbers in some of the susceptible areas. A high proportion of eggs survived but they did not hatch until towards the end of March. The cold weather also delayed growth of the wheat plants, so that tillering did not begin until about the same time that the eggs hatched. Consequently, what would in many cases have been slight damage became very serious. A large number of flies must have emerged from this generation, as the egg counts in September, 1963, were the highest for ten years. Crane Fly eggs are laid in September and hatch the following month. October, 1962, being moist and mild, was favourable to the newly hatched larvae, which survived the winter in large numbers. As soon as the soil began to warm up in April and May they became very active, but after the widespread damage by leather-jackets in 1962 farmers were quick to take adequate control measures.

Moth caterpillars

The most interesting and perhaps unexpected survivals were those of moth caterpillars. Grass Moths occur commonly on old grassland in the late summer, and high numbers were observed in 1962. When these pastures are ploughed in September for winter wheat, the larvae of one or more of the species move out of the rotting turf and attack the wheat plants, sometimes causing heavy loss. An abnormal number of such attacks occurred

in April and May, 1963. The larvae live and feed within a thin silken web around the bases of the stems of their host grasses. Allowing for the fact that some larvae would have been ploughed in to a depth of perhaps seven inches, it is practically certain that a large number of these small caterpillars were able to withstand a temperature of well below freezing for a month or more.

Two other moth caterpillars, the Rustic Shoulder Knot and the Common Rustic also survived in the same way, attacking young barley plants in the spring. A number of cases of heavy attack on blackthorn by caterpillars of the Small Ermine Moth were noted in June, 1963. In one of them dense bushes over an area of about 40 ft by 80 ft were completely defoliated. The eggs of this moth are laid in the late summer and the newly hatched larvae keep together and spend the winter under a scale formed by the egg shells. The caterpillars are very small and it is remarkable that they should have withstood the cold, particularly in exposed windswept sites.

Many species of birds also suffer severely in cold winters, especially those whose food supplies are limited. Wrens were the worst hit last year; whereas in the past their songs have introduced the dawn chorus, they were rarely heard in 1963. Their food consists of insects and other small creatures and through much of the winter these were inaccessible. Other small birds have suffered to a less extent and doubtless the insect population has gained correspondingly.

Forewarned, forearmed

The winter of 1962-63 showed very plainly that most insects (and other invertebrate animals) can survive a long spell of temperatures well below freezing point. Where numbers are normal in the preceding autumn, the chances are that they will be above normal in the following spring because of the factors mentioned in the opening paragraph.

When severe winters occur, farms should take precautions with crops which are susceptible to damage by insect pests. Of course, for autumn-sown crops weather forecasting is not yet accurate enough to indicate whether heavier seeding or extra insecticide should be applied. But knowing the expected effect of the winter will keep farmers alert to seize the first opportunity of giving a beneficial cultivation or applying more fertilizers. With spring-sown crops, precautions can be taken more easily; extra seed, fertilizers and the correct insecticide can be obtained during the cold period so that the operations can be carried out at the most suitable time.

S. W. H. Rolfe, B.Sc., is an entomologist in the N.A.S., stationed at Reading. He was previously at Wye College, Kent, where, from 1947 to 1952, he was in charge of the Colorado Beetle Campaign.

The success of the vaccine against Johne's disease of cattle, now thoroughly tested by the Ministry's Animal Health Division, lessens a disease risk with which stock-owners have had to contend for so long

Vaccination against Johne's Disease



T. M. DOYLE

It was some years ago that French scientists produced a vaccine which they claimed conferred good protection against Johne's disease of cattle. Work on this vaccine during the past twenty years, under both laboratory and field conditions, has confirmed the French results.

The vaccine consists of the causal organism of the disease (*Mycobacterium johnei*) suspended in oil. Inoculated under the skin, it gives rise to a small, hard painless nodule that persists from six months to one or two years, even longer.

Field trial of the vaccine

One trial with the vaccine was carried out in 118 heavily infected herds in different areas of England, Scotland and Wales, and it covered various breeds of cattle and types of farming, soil and conditions of hygiene. The first dose of vaccine was restricted to calves under 30 days old. In some herds only one dose of vaccine was given, whereas in others two to four doses were given at intervals varying from 16 to 24 months. We now have evidence that one dose may in general be sufficient, provided the recommended precautionary hygienic measures are carried out.

Because of the wide area over which the herds were scattered, little supervision was possible; and in some cases no information was available concerning the hygienic conditions or of the efficiency of the management.

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Two other moth caterpillars, the Rustic Shoulder Knot and the Common Rustic also survived in the same way, attacking young barley plants in the spring. A number of cases of heavy attack on blackthorn by caterpillars



An advanced clinical case of Johne's disease

There were no control animals of the same age as those vaccinated; but it should be emphasized that all animals over one month of age were left unvaccinated. The vaccine has therefore been judged on the comparative incidence of the disease in a herd *before* and *after* vaccination, the assessment being made at least seven years from the start of vaccination, that is when the animals had passed through the peak period of natural infection.

Response to a questionnaire

When the trial had been in progress for seven years a questionnaire was sent to 80 owners for their views on the results of the trial in their herds. Sixty-three replies were received. Sixty owners were completely satisfied, others were enthusiastic about the results, two thought it too soon to give an opinion, and one was disappointed.

In 32 herds there were no losses among vaccinated stock. In 28 herds the disease had either been almost eliminated or the incidence greatly reduced.

The success of the vaccine against Johne's disease of cattle, now thoroughly tested by the Ministry's Animal Health Division, lessens a disease risk with which stock-owners have had to contend for so long

reactor developed clinical symptoms. The vaccination of calves, combined with blood testing, was successful and no case of the disease has occurred during the last nine years in the herd.

HERD NO. 3

This herd was sold in 1959; up till then 3 cases had occurred in unvaccinated animals.

HERD NO. 4

A considerable number of unvaccinated adult animals were sent to the knackers in the years immediately following vaccination, but unfortunately they were entered in the farm records merely as 'casualties'. With the passing of time and changes of office staff and herdsmen, it is now impossible to obtain information on the number of cases of Johne's disease included among them.

HERD NO. 6

From 1953 to 1962 this herd increased from 18 cows to 62. The owner reported that in building up the herd cows were bought at various sales, and about one-third of these eventually developed Johne's disease.



*Early clinical case,
showing wasting of the
muscles of the hindquarters*

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In 32 herds there were no losses among vaccinated stock. In 28 herds the disease had either been almost eliminated or the incidence greatly reduced. These herds were heavily infected and the *unvaccinated* adult stock were retained until the end of their economic life.

The question as to losses in unvaccinated stock was not answered in every case and incompletely in some, but it would appear that in the five years *before* vaccination 927 animals were lost from Johne's disease in 59 herds; and in 3½ years (mean period) *after* vaccination there had been a loss of 612 *unvaccinated* animals in 30 herds. In contrast with these figures, the loss among vaccinated stock for seven years was 52 in 60 herds.

The early disposal of clinically affected animals is the most important step that can be taken to curtail the spread of the disease, but many owners neglected to do so. It was frequently admitted that a particular animal had been scouring for months before action was taken.

Vaccinated control herds

To obtain a rough reference standard for the vaccine when properly used against natural infection under field conditions, seven heavily infected herds were selected. The calves were vaccinated and kept under close observation for from seven to twelve years. Six Jersey herds were selected, as this breed is one of the most susceptible to the disease, and one Ayrshire herd. Five of the herds were vaccinated once and two herds twice.



*An advanced clinical case
of Johne's disease*



*Early clinical case,
showing wasting of the
muscles of the hindquarters*

Summary of Vaccinated Control Herds

Herd No.	Breed	Losses before Vaccination		Entered Trial Year	Number of times Vaccinated	Losses in Vaccinated stock		Losses in Unvaccinated stock	
		Years	Number			Years	Number	Years	Number
1	Jersey	1948-57	48	1950	once	1950-62	nil	1950-62	see note
2	Jersey	1949-53	16	1953	once	1953-62	nil	1953-62	see note
3	Jersey	1949-53	21	1953	once	1953-59	nil	1953-59	3
4	Jersey	1949-53	24	1953	twice	1953-62	nil	1953-62	see note
5	Ayrshire	1949-53	17	1953	once	1953-62	one	1953-62	18
6	Jersey	1950-53	7	1953	once	1953-62	nil	1953-62	see note
7	Jersey	1952-55	13	1955	twice	1955-62	nil*	1955-62	7

* One animal vaccinated at six months of age developed clinical Johne's disease

HERD NO. 1

The owner lost £10,000 during recent years through Johne's disease. In view of the heavy losses the adult stock were blood tested (complement-fixation test) and vaccinated to hasten the control of the disease. There were 17 positive reactors to the test and 15 doubtful. The vaccine gave excellent results, no case of the disease occurring in any animal vaccinated as a calf.

HERD NO. 2

The adult animals were blood tested and 20 in-calf heifers vaccinated. One adult positive reactor developed clinical symptoms. The vaccination of calves, combined with blood testing, was successful and no case of the disease has occurred during the last nine years in the herd.

HERD NO. 3

This herd was sold in 1959; up till then 3 cases had occurred in unvaccinated animals.

HERD NO. 4

A considerable number of unvaccinated adult animals were sent to the knackers in the years immediately following vaccination, but unfortunately they were entered in the farm records merely as 'casualties'. With the passing of time and changes of office staff and herdsmen, it is now impossible to obtain information on the number of cases of Johne's disease included among them.

HERD NO. 6

From 1953 to 1962 this herd increased from 18 cows to 62. The owner reported that in building up the herd cows were bought at various sales, and about one-third of these eventually developed Johne's disease.



*Swelling under the jaw
which occurs in many
infected animals*

Tuberculin reactions of vaccinated cattle

When the vaccine is inoculated under the skin it induces reactions to both mammalian and avian tuberculins. This has prevented its more general use while tuberculosis was prevalent in the country and the tuberculosis eradication campaign was being pursued. Although vaccinated animals react to both tuberculins, the reaction to the avian is usually stronger than that to the mammalian, and it persists longer. Occasionally the two reactions are equal and rarely the mammalian is slightly the larger.

It is clear from the experience gained from the field trial that when the intradermal comparative tuberculin test is used on a vaccinated herd there is rarely any difficulty in the interpretation of the results.

Precautions to be taken in vaccinated herds

Clinically affected animals should be isolated immediately and sent for slaughter. It was common practice in some of the trial herds—as indeed is the custom in many herds—to retain cows for a considerable time after the onset of symptoms, usually until the animal had calved, although owners were aware of the risks involved. The clinically affected cow is the main source of infection.

Calves should be bucket-fed and not reared on their dams because of the risk of contracting infection from faeces on the udder. It is impossible to determine visually whether an apparently normal cow is excreting *M. johnei* in the faeces. Udders should be washed thoroughly before taking milk for calves. The excretion of *M. johnei* in the milk is rare and probably occurs only in advanced clinical cases.

Foetuses from cows in an advanced stage of the disease can be infected. When a calf is born infected it can transmit the disease to healthy calves in contact with it; and it may possibly develop clinical symptoms later on. Calves of affected cows or of cows that develop symptoms shortly after calving should not therefore be retained in the herd. And because infected calves can transmit the disease to healthy in-contacts, a separate pen should, if possible, be provided for each calf—a practice that has many other advantages in general disease prevention.

A safe and effective method

The results of the field trial, supplemented by those of the control herds, prove that vaccination is a safe and effective method for the control of Johne's disease against natural infection under field conditions, irrespective of the susceptibility of the breed of cattle involved. No animals need to be taken out of the herd unless they are clinically affected; neither does vaccination interfere with normal farming routine. Provided a few precautionary hygienic measures are taken to reduce infection, one dose of vaccine within 30 days of birth would appear sufficient in most cases to control the disease. It must be emphasized, however, that the immediate removal of clinical cases from among the unvaccinated stock is essential for the successful use of the vaccine.

The blood test and vaccination of adult cattle in two herds gave good results, but the number of animals involved was too small to allow any conclusions. As the procedure is safe it merits further trial. It may and probably will assist in the quicker control of the disease. The interpretation of tuberculin tests in vaccinated cattle presents no unusual difficulties and is, therefore, no obstacle to the use of the vaccine.

Having regard to these facts, and bearing in mind the high incidence and wide distribution of Johne's disease, there does not appear to be any sound alternative to vaccination in the foreseeable future.

The author of this article, **T. M. Doyle, F.R.C.V.S., D.V.S.M.**, joined the Ministry in 1924, after service with the Governments of India, Egypt, and the Union of South Africa. He remained on the staff of the Central Veterinary Laboratory at Weybridge until he retired at the end of last year.

Post-graduate Awards in Agricultural Research

The Agricultural Research Council this year offers thirty post-graduate studentships in agricultural research, including veterinary training grants. The closing date for applications is 16th March.

In addition, two Veterinary Research Fellowships are offered to workers holding a veterinary qualification and having at least three years' experience in veterinary research, and three Agricultural Research Fellowships to honours graduates in science with not less than three years' post-graduate experience. These Fellowships are tenable for a period of up to three years, and applications for them may be made at any time.

An explanatory booklet, *Post-graduate Studentships and Fellowships offered in 1964* may be obtained free from the Secretary, Agricultural Research Council, Cunard Building, 15 Regent Street, London, S.W.1.

**Results of a two-year grassland survey (1961-62)
by the N.A.A.S. in CHESHIRE**

Pinpointing Success with Grass

R. Hope

OUTPUT from grazing on commercial farms can really only be measured by means of a survey. Such a grassland survey was carried out by the N.A.A.S. in Cheshire, during 1961 and 1962. Sixty-five farmers co-operated in a grassland recording scheme, providing data from 4,600 acres.

The Utilized Starch Equivalent (U.S.E.) method was used to calculate the output. Normally this involves a rather formidable amount of recording, but in the case of the Cheshire survey many of the participating farmers were already taking part in feed recording schemes. And the fact that on the intensive Cheshire farms only dairy stock were being carried meant that there were no complications arising from the presence of beef cattle or sheep, so this also helped to simplify the recording.

One of the most striking features of the results was the way in which the grassland responded to fertilizer treatment and particularly to nitrogen; in fact a steady increase in output was obtained almost in direct proportion to the amount of nitrogen used.

U.S.E. EXPLAINED

This method of estimating output from a determined area of grass is based on the British Grassland Society's standards. This figure is obtained by calculating the theoretical starch equivalent requirement of the dairy stock and deducting from it any starch equivalent supplied as feed supplementary to the grass grazed.

The estimated S.E. of grass conserved in the form of hay or silage is added to that calculated as utilized for grazing to give the total output from the grassland.

Influence of Nitrogen

<i>Units N per acre</i>	<i>U.S.E. cwt/acre</i>
0—20	12.1
80—100	18.0
140—160	22.6
200+	26.1

Influence of Stocking Rate

<i>Acres per cow equivalent</i>	<i>U.S.E. cwt/acre</i>
2.2	15.7
1.8	17.7
1.5	19.0
1.2	23.8

Nitrogen plus heavier stocking

It will be noted that the output was doubled by the use of 200 units of nitrogen. In other surveys medium dressings of nitrogen have often resulted in a depressed yield, which is usually attributed to the suppression of clover in the sward. No such suppression appears to have occurred in the Cheshire swards, but then vigorous clover is not normally an outstanding feature of Cheshire pastures; they are predominantly grassy. There can be no doubt that nitrogen is the key factor in production from grassland; phosphate and potash had a relatively small influence on the output.

The U.S.E. figure is a measure of both the yield of herbage produced and the efficiency of its conversion into livestock products. With the help of nitrogen, heavy yields of grass are easy to achieve, but there is little point in producing them if they are not used effectively. Stocking rate has an important bearing on good utilization, just how important can be seen from the Table on page 68.

A high stocking rate goes a long way towards ensuring good utilization. It compels a good standard of grassland management, enforcing close and even grazing and reducing the opportunities for waste which occur where acres are allocated too lavishly.

While nitrogen use and stocking rate are the two most important factors in obtaining high output, other interesting matters were brought to light by the survey. One of these was the performance of leys in comparison with that of permanent grass.

Leys and permanent grass compared

Leys were superior to permanent grass at the lower levels of nitrogen application, but as nitrogen use increased the difference in productivity was not so evident. This confirmed recent views that the productivity of permanent grass can equal that from leys. But it should be remembered that, in the Cheshire survey, all the recording farmers were grassland enthusiasts and their permanent grass could be regarded as above average standard.

U.S.E. per acre

Units N per acre	Perm. grass	Leys
20— 40	13.5	18.0
60— 80	15.8	19.0
100—120	18.5	20.4
140—160	21.1	21.0

One disappointing feature of the leys' performance was the loss in production suffered in their establishment year.

Production from Leys in the Seeding Year

Units N per acre	U.S.E. (cwt/acre)	
	Leys sown 1962	Italian ryegrass sown 1963
0— 40	9.7	7.2
40— 80	14.0	18.9
80—120	15.3	25.5

Thus, as can be seen above, only 15 cwt U.S.E. per acre was obtained from these leys, even when fertilized with up to 120 units per acre of nitrogen. This is a point which farmers might bear in mind when considering what acreage of grassland they can afford to reseed in any one year. Italian ryegrass, however, showed no such limitations when given reasonable levels of nitrogen, and under those conditions could give high output even in its establishment year.

Seeds mixture unimportant

The type of seeds mixture used seemed to have very little influence on the productivity of the sward. It is true that in both years the timothy/fescue leys showed slight superiority over other types of sward, but it is unlikely that this small difference is really significant.

Types of Sward

	<i>Units N per acre</i>	<i>U.S.E. cwt/acre</i>
Cockle Park type	120	19.4
Perennial ryegrass	120	20.0
Timothy/fescue type	127	21.6

U.S.E. the pointer

Looking at the financial information available on most of the farms concerned in the survey revealed a very close correlation between profitability and the output of U.S.E. per acre. Thus the U.S.E. method of calculating output would seem to be a good indicator of profit on the dairy farm. But it can only be so where efficient use is made of the conserved grass in the form of silage and hay during the winter and where concentrated feeding is strictly controlled. The U.S.E. method of calculating output is most accurate when supplementary feeding is at a minimum; extravagance in the use of concentrates must be strictly avoided.

The lesson to be learned from this survey is surely that for profitable milk production from grassland, attention must first of all be given to the level of nitrogenous manuring and the intensity of stocking. These are the factors that really determine the level of output. Other matters, such as seed mixtures, clover in the sward, etc., are much less important.

R. Hope, B.Sc., N.D.A., is County Advisory Officer for Cheshire in the National Agricultural Advisory Service. He is particularly interested in farm business management and grassland management.

**How worthwhile
is it to release
young farm
workers for part-
time training?**



Graham Boatfield

answers this question as far as East Suffolk is concerned

Part-time Students

PART-TIME agricultural education is on the increase. This is so not only in the north and west where, historically, an interest in self-help and part-time education has for a long time been strong, but also in the south and east, arable areas where there are a greater number of farm workers.

There is no single or simple pattern of part-time agricultural education; there is no single structure of examinations nor any universal scheme of work. And this is as it should be, for there are wide variations between different parts of the country, different farming systems, and differences even from county to county within a region. While the agricultural syllabuses of the City and Guilds of London Institute have gained wide support, there is much to be said for the schemes laid down by the regional examining bodies, and a number of county authorities have their own approach to the design of work schemes for part-time classes.

Coupled with the increase in formal agricultural classes, leading to examinations, there is a parallel increase in tuition and testing on the practical side. These are now open to all agricultural apprentices, students taking City and Guilds examinations, and anyone else interested. And there is a steady rise in the demand for them, so calling for an increase in instruction, very often allied with the normal work of day release classes.

In East Suffolk

The principles underlying the arrangement of classes in East Suffolk are two: (a) to give young workers in agriculture a chance to gain some training and to get qualifications which may be useful to them later; (b) to provide

courses and types of training which are of direct and in many cases of practical use to the young worker, and at the same time which show his employer that the time spent off the farm is being put to good use.

There are two main types of agricultural day classes—Stage 1 and Stage 2. Stage 1 classes take two winters to complete, and during this time the young people are expected to work at all the three main subjects simultaneously—Crop Husbandry, Animal Husbandry, and Farm Machinery. It has never been considered reasonable to teach only one subject or even two subjects in a winter, because however restricted his own personal interests may be, it is not right that anyone working on a farm should more or less have to close his eyes to any large section of work which is going on. Because a very important part of the work of a class, which is actually done on the farm, is observation and recording, it is important that all sections of farm work should be watched and recorded carefully by the student.

In our case, the arrangement of work in a Stage 1 class is progressive. It takes two years—that is, two winters of one day a week from the end of September to the middle of March. Over the two years the work is not merely chopped into two equal portions, the first part being dealt with in the first year, but it is designed in a scheme of work that puts what we consider to be the first things first.

During the first year of farm work, the student—whether apprentice, farmer's son, student, or ordinary farm worker—needs a course that 'puts him in the picture' about what is happening on the farm where he works. There is little point at this stage in talking much to these students about the scientific principles behind farming practice; it is far more important to give them an up-to-date impression of what is happening, and what changes are taking place, on the farm where they work and on other farms they may visit.

First- and second-year courses

Thus our first-year classes in Crop Husbandry deal with crops as they are grown, cultivated and harvested on the farm. The Animal Husbandry classes deal with the practical management and performance of cattle, pigs and sheep. The Farm Machinery classes deal with the work done on the farm by the usual range of farm implements. A class of this type is of considerable value to the ordinary young worker who will stay on a farm for a number of years, to the intending farm institute student, and in our experience also to students who are going on to university or college courses.

In a second-year course we move on from ordinary farm practice to consider the principles underlying that practice. It is only when a student has been given the general picture,

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allowed to look and find out for himself on the farm, and generally to feel his feet in the industry, that he can spare the time and the mental energy to go into the principles. A basic teaching concept is 'to proceed from the known to the unknown', and this is what we do.

At the end of the second-year course, students sit for their City and Guilds examinations—usually in March. Those few students (and they are very few) who are not up to examination standard, can take a later examination (in June) with the aid of a concentrated short course of revision and individual help during April and May. All students can also take a number of practical proficiency tests. We have concentrated on basic tests, which all students take—tractor driving, root hoeing and singling, and further tests according to each student's own experience and needs.

And after that?

Having completed a course like this, the student—with three City and Guilds passes to his credit—may well decide that he has had enough of part-time agricultural education and leave it at that. Some students will go on to farm institutes, but there is a growing number who—either because they are agricultural apprentices or more likely because they feel the need for further education locally—are prepared to stay on and take a third or even a fourth year part-time day class.

These third and fourth year classes cover Stage 2 work. Once again there are three main subjects—Crop Husbandry, Animal Husbandry, and Farm Machinery. And once again our approach has been to design a course which is not too one-sided, but which provides something useful with a fairly general type of training. An Arable Farming Course deals with Crop Husbandry, Farm Machinery Operation and Care, a considerable amount of farm study, both on the students' own farms and on teaching farms near the Centre where they are taught, and training for practical proficiency tests. Similarly, a Livestock Farming Course provides instruction in all the main branches of livestock husbandry; practical proficiency tests, farm studies, and farm machinery, with a different emphasis from that given in the Arable Farming Course.

At the end of three years it is easily possible for an average student to have five City and Guilds passes, three or four practical proficiency tests,

and OUTSIDE

and a good general knowledge of modern farm practice and principles.

A young man with this sort of training has achieved something of value in a fairly short working life. He can look forward to the better jobs, and at a time when the agricultural labour force is shrinking and becoming more skilled, his training will stand him in good stead.





Practical proficiency test on the baler at the Agricultural Education Centre, Witnesham

Re-thinking

Dealing with this type of educational problem calls for several things which have not always been available in the past. First comes teaching staff having a good practical and technical knowledge, an ability to communicate at this level, and above all with an interest in and sympathy with their students. Then proper premises for the work—which are not always found in the church halls and cast-off schoolrooms which are still used for day classes in some places. Perhaps the most tricky problem is to provide an opportunity to teach agricultural practices, and in particular to provide what is needed to give adequate teaching for practical skills.

It can be argued—it must be if we are to get things right—that the basic, practical teaching of the majority of young farm workers is the biggest job in agricultural education. It can also be said that this part of the job of instruction needs more and better practical facilities—farms, machinery, crops and livestock—than any other. This is true to whatever level one goes, because it is in these early days that practical skills are taught and that farming practices and principles are imparted most economically.

Ultimately we may find all young farm workers coming to day-release classes. This is probably a long way off yet and will call for a reassessment of the type of worker the farming industry needs.

Graham Boatfield, N.D.A., Dip. Agric., is Agricultural Education Organizer for East Suffolk. Educated at Wye College and Reading University, he held various advisory and technical posts in different parts of the country and was Lecturer in Agriculture for Herefordshire Education Committee before moving to East Suffolk in 1954.

THE EMLYN QUALITY WEANER GROUP

Top Quality Weaners



David S. Downey

THE area within 7-9 miles radius of Newcastle Emlyn on the borders of Cardigan, Carmarthen and Pembroke, has always been noted for its mixed farming. Traditionally most farmers kept four or five sows, and following the 1914-18 war the production of heavy porkers ('cutters'), which catered for the South Wales industrial areas, became a feature on most farms.

The second world war destroyed this pattern, but the area kept its interest in weaner pigs, most of them being disposed of through the auction market.

Weaners are, of course, subject to rather similar market fluctuations to those of fat pigs, and in the autumn of 1962 leading farmers from South Cardigan, West Carmarthen and North Pembroke met at Newcastle Emlyn to discuss the formation of a Weaner Group to see whether a co-operative form of marketing could rationalize prices for their product.

Getting started

With the help of the Welsh Agricultural Organization Society, Aberystwyth, a group of 46 members was formed. A contract was signed for the group to provide a leading South Wales bacon and pork producer with 70-90 weaners a week for a period of five months, and four other bacon and pork producers agreed to buy small numbers as and when available. The main buyer described the type and weight of weaner required and the group undertook to supply what he wanted. Trading started on 22nd November, 1962. An Advisory Committee was formed to prepare a programme of talks and demonstrations designed to keep members abreast of developments.

After a year's operations there were 112 members in the group, trading the produce of about 750 breeding sows. The main buyers now are a group of bacon producers from Worcestershire, who have made a contract for 140-150 weaners a week for a period of 12 months at 2s. 3d. a lb up to 60 lb and 1s. 6d. a lb thereafter up to 70 lb. Pigs over 70 lb are sold at the 70 lb price. Only top quality white pigs are accepted.

How the group works

Members undertake to dispose of all weaner pigs through the group. They inform the Secretary by postcard of their entries of weaners 11 days in advance: this gives him an opportunity to match the supply to the demand. His first objective is to supply the main buyers, after which he is able to contact the smaller buyers to take up small lots to clear the entries.

The weaners are delivered by members to a central collecting point once a week. A panel of producer members take it in turn to check over the consignments for quality and ear-marks, and to weigh the pigs into the buyer's vehicles. Because the present buyers only accept top quality pigs, unsuitable animals are rejected at the weighing stage. The buyers pay the Secretary for their consignment of pigs and he in turn pays the producers by cheque four days later. A levy of 1s. per pig is deducted to cover expenses, and there is a membership fee of £3 to cover capital costs such as rent of collecting centre, purchase of weighbridge, etc. Each member has a farm code number and each weaner is tattooed with this number. Buyers are asked to report periodically on their consignments, and this gives the group an opportunity to take steps to improve quality. Producers of low category or unthrifty pigs are visited by N.A.A.S. advisers to diagnose their production problems and to suggest ways of improvement.

The Group's Executive Committee is responsible for dealing with problems and difficulties as they arise and for recommending disciplinary action when necessary. They have been fair, firm and consistent in all their actions.

What makes it a success

The buyers have confidence in regular supplies of high quality weaners of uniform weight and can plan their output well ahead. Weaner producers also have confidence—in a regular market at a price known well in advance. Instead of being an opportunist kind of enterprise with uncertain rewards, weaner production is becoming a main feature of members' farms.

The system of checking on quality carried out by the group itself is most effective. Members are careful to present only high-grade pigs at the collecting centre to avoid the indignity of having their pigs rejected in the presence of neighbours.

Discipline is important. Members' entries are not accepted unless prior notice has been given in writing. Failure to enter at the proper time means delay in selling. This results in the producer having to feed his pigs for another week. The extra weight gained during this time is likely to fetch the lower price or, if 70 lb live weight has been reached, no extra money is obtained. Once the pigs are entered members must present their pigs at the collecting centre. Members who default have their cases considered by the Executive Committee. In all cases, so far, defaulters have lost their membership for six months.

Chairman and Secretary

The group is led by a very strong Chairman, Mr. T. H. Evans, of Troedyraur, Brongest, a man who is admired throughout West Wales for his success as a farmer and a stock-breeder. He has won the top awards in major shows with his Welsh pigs and in bacon carcass competitions. His contacts are invaluable for the group, and his humour and jovial spirit make it possible for him to administer the sternest disciplinary measures without incurring malice or ill-feeling from members.

The Secretary, Mr. E. R. Jenkins, Manager of the Emlyn Agricultural Society Ltd., is quiet, efficient and very firm in his dealings with members. Lax discipline in the trading arrangements would have spelt failure. His organizing ability and tact in dealing with members is second to none.

All these pointers to success are strengthened by the fact that the members themselves are drawn from an area with a long tradition of co-operation. Many are related by birth or marriage. All work together amicably and all are keen to do what is right in the interests of the group.

Tines for Pick-up Attachments

The pace of standardization work in agricultural engineering is rapid. In the last few years, manufacturers, designers and farmers have worked with the B.S.I. to produce a wide variety of standards for both large and small items of machinery—from mower knife sections to tests for tractors. Their co-operation saves the farmer—and the industry—time and money, for it is only with standard dimensioning and positioning that the interchangeability becomes a practical possibility.

In the latest agricultural standard to come from the B.S.I., *Agricultural pick-up times: attachment details* (B. S. 3689), the aim has been to enable a farmer, in an emergency, to replace a damaged tine by one of a different make—even if this involves a little improvisation such as drilling extra holes. Most implement manufacturers should be able to comply with the new standard without any significant alteration of their production.

Dimensions and materials are specified for two types of standard tine: one intended primarily for pick-up balers and the other mainly for rotary pick-up attachments for combine harvesters.

Copies of B.S. 3689 may be obtained from the B.S.I. Sales Branch, 2 Park Street, London, W.1. price 4s. plus postage for non-subscribers.

Research Spot

Barley Feeding for Beef

Castration or Entire?

Sheep Housing

Oestrus in Ewes

Cereal Protein for Chicks

Five items from the 1963 Report of the Rowett Research Institute, price 10s. from the Librarian of the Institute, Bucksburn, Aberdeen

Research at Rowett

ANY change-over from a diet of mainly grass, or other roughage, to high cereal feeding—say predominantly barley for beef production—should be done gradually. This warning is underlined by the reports of deaths among farm animals on a number of farms where the switch has been at all sudden. Symptoms of the disease were noted frequently within two days of the change and consisted of posterior inco-ordination and dullness, followed by a refusal to eat and ultimately recumbency and in some cases death. The cause of the condition is thought to be an acidosis due to intense lactic acid fermentation in the rumen as a result of the sudden introduction of cereal feeding.

Rowett has devised a special 'high fibre' diet which can be given *ad lib.* from hoppers immediately cattle come off grass or from other conventional rations. The plan is to give the 'high fibre' diet for 10 days and then to substitute gradually the standard barley diet over a further 10 days, so that at least 20 days elapse before the change-over is complete. This system has been investigated in trials at Rowett and with more than 500 cattle on farms in the north-east of Scotland. There were no losses in any of the trials, and performance of the cattle over the change-over period was very satisfactory.

Bulls or steers?

Ten pairs of male Friesian twins have been under trial to see whether castrated or entire animals responded the better to methods of intensive beef production. All were reared to 2 cwt live weight on the standard early-weaning system and subsequently on a diet of rolled barley and protein supplement.

The rate of weight gain and feed-conversion efficiency was 10 per cent better for bulls than steers; the carcasses from bulls had a slightly higher percentage of meat in the higher-priced cuts and were significantly leaner compared with the steer carcasses. There was a strong indication that meat from bulls was tougher and had slightly less flavour than that from steers, but this part of the study is being done elsewhere under the direction of the Ministry of Agriculture, Fisheries and Food.



*The sheep stell at Rowett,
described below*

Sheep stell

A specially designed shelter for sheep—a modified stell—has been put up at Rowett, which it is hoped will solve many of the housing problems associated with orthodox buildings, especially high cost and ventilation. Constructed of corrugated and sheet steel, the stell is, in effect, a 30-ft diameter 4-ft high circular wall with a 5-6-ft-wide roof running round the inner side. The roof rises approximately 1½-ft between its outer and inner edges, the latter carrying a 1-ft high collar. There are approximately 700 sq. ft of enclosed space, including about 400 sq. ft with roof cover. Access to the interior is by three or four 'pop poles' 18-20 in. wide and 27 in. high. A double door, 8 ft wide, allows for mass entry or evacuation of sheep or the passage of bulky objects such as racks, troughs, hay bales, etc.

Stimulating oestrus in ewes

Putting vasectomized (teaser) rams into a ewe flock prior to introducing the fertile rams has been under investigation for the past three breeding seasons. In each season teaser rams were run with a flock of 60 North Country Cheviot ewes for 14-18 days before the fertile rams were introduced. A further 60 ewes acted as controls, in that they remained unteased but were mixed with the 60 teased ewes when the fertile rams were introduced. Over three seasons the percentages of ewes lambing weekly were, for the teased group 30 in the first, 36 in the second, 29 in the third and 5 in the fourth weeks, and for the non-teased group in the respective weeks, 9, 16, 42 and 32.

The method is giving promising results when tested on a farm scale where over 600 ewes in each group are being recorded. There appear to be advantages in having a concentration of lambing in the first two weeks of the season instead of in the third and fourth.

Chick feed

The proportion of protein provided by the cereal part of the diet for poultry is almost one-third when the bird is young and increases to about two-thirds in the adult bird, as the need for protein in the diet is then reduced. In three experiments individually-caged chicks were fed from 1 to 4 weeks of age on all-cereal diets *ad lib.* The order of the protein values found was oats, barley, maize or wheat, a result to be expected from the amino acid make-up of these cereals in relation to the requirements of the chick.

Worms are common to every herd and flock. It is when their numbers are allowed to build up that trouble can be expected

J. F. MICHEL, M.A., Dip. Agr. Sci.,
of the Ministry's Veterinary Laboratory,
discusses the whole question in two important articles

1

Helminthiasis

and grazing management

THE process of grazing is inherently unhygienic. The herbage becomes contaminated with the animals' excreta and this introduces the risk of helminth infection. It is the purpose of these articles to consider some of the complexities of the relationship between management and worm infection and to suggest, by reference to general considerations and specific examples, that while many practices aimed at making conditions less favourable for the parasites are largely irrelevant to the incidence of helminthiasis, it is only measures based on an adequate knowledge of epidemiology that are worth while.

The nematode worms, which are the cause of parasitic gastro-enteritis and of husk in sheep and cattle, all have a broadly similar life history. The adult worms living in the bowels or lungs of the host animal lay eggs which pass out in the dung and must undergo a period of development on the pasture before they are capable of infecting another host which may swallow them.

Infection from pasture

This arrangement means that the worms cannot multiply in the host animal alone; each worm in the host has been picked up from the pasture as an infective larva. In the same way the number of free-living stages of the worms on the pasture cannot increase unless more are added in the dung of an infected host. A worm infection in the animal does not, therefore, invariably run the same typical course. The worms can increase in number only if new infection is picked up from the pasture, and the rate at which this occurs can vary or it can be interrupted.

It follows that the presence of infection does not necessarily imply the presence of disease; indeed, most of the common parasites are present in nearly every flock or herd and on the farms where these are kept, even where parasitic disease is rarely seen. Farms free of any of the common parasitic round-worms scarcely exist, nor are the prospects of eradicating worm infections good. To be eradicable, a disease must either result in plainly recognizable symptoms in every infected animal or it must spread through the herd very slowly, and infected animals must be reliably identified by some test. Moreover, the danger of accidental mechanical introduction of infection must be very small.

Helminth infections manifestly do not satisfy these requirements. The situation could not be reached in which all precautions could be relaxed, save those aimed at preventing the introduction of infection on to the farm. But if true eradication is impracticable, this does not mean that particular groups of animals cannot advantageously be reared worm-free. Further reference to such procedures will be made later in this article.

Helminth parasites are likely to remain a factor in the environment of the grazing animal and stockmen must learn to live with it. To this end an understanding is needed of the biology of each species of parasite, for they differ in many important respects, and of its relationship with its host. This information is only gradually being elucidated. In its absence it used to be assumed that an animal's worm burden was directly related to the total number of infective larvae which it had swallowed, and that the infestation on the pasture depended in a similarly simple fashion on how many worm eggs had been passed on to it in the animals' droppings.

Hence it was visualized that disease was the outcome of a process of increasing numbers of worms on the pasture and in the animals, involving several generations of worms, until a worm burden of harmful size was reached. This view justified the belief that anything which was harmful to the parasites, even to a limited extent, must be of value in the control of helminthiasis; and it was on this basis that the effect of various aspects of management was discussed.

Among these were the length of the herbage, the density of stocking, rotational grazing and mixed grazing, or alternate grazing with sheep and cattle or with different age groups. Some of these ideas warrant further inquiry.

Herbage length

The length at which herbage is maintained affects the microclimate in which worm eggs and larvae live and develop; if the herbage is very short conditions are on the whole less favourable for the worms. On the other hand the concentration of larvae on the herbage tends to be greater near the soil surface, and it could therefore be argued that in long herbage the stock would tend to eat that part which was less heavily infected. Again the length at which the herbage is maintained cannot be dissociated from the manner in which this is done. In practice, keeping the grass very short may imply a heavier rate of stocking, which in turn means greater contamination of the pasture and less selective grazing. It also means a smaller daily intake of herbage per head and, while this would result in the ingestion of fewer larvae, a lower nutritional status may adversely affect the animals' resistance to worm infection and to its harmful effects.

Stocking density

The density of stocking exerts an effect in a similarly complex manner. Heavy stocking is thought to increase the hazard of helminthiasis on account of the greater quantity of infected dung falling on each acre. Except in conditions of very extensive agriculture, however, nearly all the herbage produced is utilized advantageously, and there must be some constant relationship between the production of herbage and the stocking density. The same number of animals will contaminate and consume the same quantity of herbage, and the area on which that herbage is grown has little direct significance. On the other hand the density of stocking may affect the length of the herbage. Further, the frequency with which any particular part of the pasture is contaminated and grazed will be greater where stocking is dense. This may lead to a greater uptake of worm larvae since they may have less time in which to die off before the herbage on which they are situated is eaten.

Rotational grazing

This factor is also vital to the discussion of the supposed value, in the control of helminths, of rotational grazing. It is argued that where this system is employed the stock leave each parcel of ground before the worm eggs which they have deposited on it have grown to the infective stage and do not return to it until the majority of the infective larvae have died. This is well enough when the interval between successive grazings really is long enough for all or nearly all the larvae to have died, but if the period is rather shorter the comparison between the effects of set stocking and rotational grazing is less simple.

In conditions of set stocking the infection put out in the dung during any given week, say, is spread over the entire area grazed. Thus as great a concentration is not reached as in conditions of rotational grazing. In the latter this quantity of infection is all deposited on one small fraction of the grazing area. The rotationally grazed animal is therefore always grazing pasture which has been heavily contaminated but has since had a fixed period of rest. During the rest period the numbers of worm larvae may have decreased. Under conditions of set stocking, on the other hand, the animals are exposed to freshly contaminated grazing, but the infection, having been spread over a much larger area, is more dilute.

The time interval between successive grazings of each paddock must of course be determined largely by considerations of efficient grassland utilization, and this normally necessitates a period which is too short for the number of larvae to be sufficiently reduced. Indeed, in the case of a number of species of gastro-intestinal parasites recent work has shown that, in the field, development to the infective stage proceeds at much less than the optimum rate, and that there are great differences in the rate of development of the fastest and slowest. In consequence, of the worm eggs dropped in the dung at one moment some will reach the infective stage weeks after the first, so that a population of larvae resulting from eggs dropped at one time does not rise quickly to a peak and then decline. Instead, it rises rather more slowly to a level which is maintained for a period of months.

It is hardly surprising that scarcely a single trial in which the effect on worm burdens of set stocking and of rotational grazing has been compared has shown any significant or consistent difference between the two systems.

Alternate grazing

Alternate grazing with different kinds of stock is sometimes advocated as helping to prevent helminthic disease, and it is certainly one way in which the period between successive grazings can be lengthened. Beyond this its supposed virtue is based on two assumptions. The first is that most of the infection deposited on the pasture at one time will shortly appear on the herbage and that if this is grazed off the subsequent growth will be relatively clean. The second is that hardly any species of worm are common to both sheep and cattle. Neither assumption is well founded.

It will be seen that these aspects of husbandry have an ambiguous, or at best a limited, effect on helminths. To what extent practices exerting a limited effect can have a place in the control of helminths will be discussed in the second of these articles.

Mr. Michel's second article will appear next month.

The Ministry's Publications

Since the list published in the January, 1964, issue of *Agriculture* (p. 34) the following publications have been issued.

BULLETIN NO. 188

Quick Haymaking (New) 6s. 6d. (by post 6s. 11d.)

Speed in haymaking is important, since the quicker the crop is dried the higher its nutritive value. This Bulletin describes tested and effective methods of getting a quality product.

TECHNICAL BULLETIN NO. 2

Laboratory Methods for Work with Plant and Soil Nematodes (Revised) 8s. 6d. (by post 9s.)

Describes the specialized methods for solving the problems facing the worker with plant and soil nematodes. It will also be of interest to agricultural entomologists, plant pathologists and others who have to advise on eelworm problems.

ADVISORY LEAFLETS

No. 88. Scale Insects on Fruit (Revised)

No. 514. The Disinfection and Disinfestation of Poultry Houses (New)

FARM MACHINERY LEAFLET

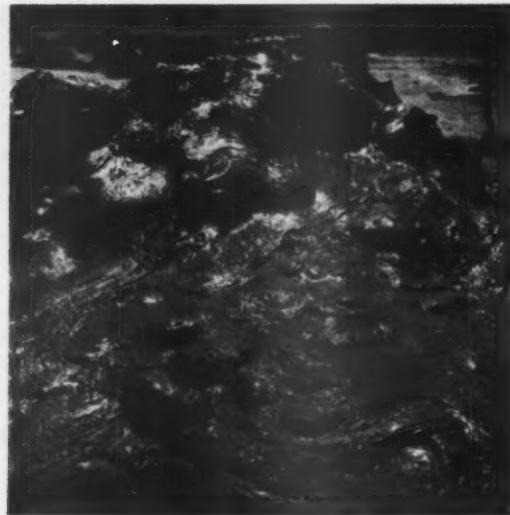
No. 8. Corn Drills (Revised)

FREE ISSUES

Obtainable only from the Ministry (Publications) at the address below.

Safe Handling of Cyanide Gassing Powders (New)

Single copies of Advisory Leaflets, up to a maximum of six different leaflets, may be obtained free from the Ministry (Publications), Government Buildings, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be bought from Government Bookshops (addresses on p. 100). Other publications are obtainable from Government Bookshops, from Divisional Offices of the Ministry or through any bookseller.



P.F. ash at Hams Hall

**Bringing
back
the
Acres**

Pulverized Fuel Ash

W. Morley Davies

MODERN coal-burning electric power stations are producing pulverized fuel ash in ever-increasing quantities. Production this year is about 6 million tons. While intensive research is being carried out to find industrial uses for some of it, the bulk, at any rate for a time, must find a home in pits, quarries and such places. The coal-burning power stations nowadays are sited close to their sources of fuel and by far the greater number are in the Midlands.

Disposal sites

At the present time the stations can dispose of most of this ash in disused gravel pits, lagoons, on agricultural land and by industrial uses.

Disused wet gravel pits occur in gravel-bearing river valleys such as the Trent, Tame and Lee. Planning consent to work the gravels insists that the pits are filled if a suitable material is available. Such a material may be pulverized fuel ash. Moreover, such consent normally insists on the preservation of the soil and its subsequent return as a cover to the ash, thus enabling crops to be grown. Dry gravel pits, where they occur, are also used.

It may be that no pits are immediately available, and in some cases lagoons as permanent resting places for the ash have had to be excavated. In other cases lagoons have been built up in river estuaries, such as the Dee, by

making embankments. In the latter case there may be no soil for covering, all of it having been used for building the walls.

In a few cases agricultural land has had to be taken, the soil stripped and ultimately replaced on a deep covering of ash. It is likely that this method, or some modification of it, will have increasingly to be used as stations multiply and natural sites are inadequate to cope with the quantity of material.

Vigorous efforts are being made to find industrial outlets for ash, and already some of it is being used in road foundations and the making of barrier walls, bricks and concrete.

Soil consciousness

The Electricity Authorities are anxious that land used for depositing ash shall be used for some beneficial purpose such as agriculture, for it is realized that the attitude of the community to the disposal of fuel ash may well be influenced by the efforts now being made to achieve good restorations for subsequent profitable farming. To that end they have, by grants to University Departments, sponsored research into plant growth.

One subject which has required research has been toxicity, especially boron toxicity. Unfortunately, most ashes, especially when fresh, exhibit toxicity in varying degrees towards plant life. This is particularly, but not entirely, due to the presence of the element boron. The amount present depends on the source of the coal, the treatment of the ash and the degree of weathering which it has had. Lagooned ashes are, on the whole, less toxic than those fresh from the separators.

A second subject of research has been the habit of some ashes of setting into hard layers just below the surface. The extent to which this characteristic is detrimental to plant growth requires further investigation.

Wherever possible (and that is in the majority of cases) the top soil is initially stripped and ultimately restored. For good general farming the soil should be at least 1 ft thick after restoration, but unfortunately this is not always possible; in gravel-bearing areas it may initially fall short of that depth. Investigations on a field scale are now being planned to discover how far ash can be mixed with soil to get a deeper crop-bearing medium. Failing a soil layer, investigations have shown that even a thin covering of shale or silt can greatly improve crop growth, compared with that on bare ash. At almost all the power stations the problems of cropping on areas where ash has been deposited vary. Each must be considered individually in respect of site, the nature of the ash and the covering materials available.

Nature of pulverized fuel ash

Physically, pulverized fuel ash resembles a fine sandy silt in the size of its particles. It is very retentive of moisture so that grassland established on it directly, or with the benefit of soil cover, like grassland on silts, resists drought. This feature is of enormous value and could lead to much improved croppings where the ash has been deposited on dry sites. It contains no colloidal matter and so is not retentive of plant foods. But after a period of cropping this shortcoming may be partially remedied by the accumulation of humus derived from plant remains, by farmyard manure or by the incorporation of clay. The habit of some ashes of setting into hard layers just below the surface has already been mentioned.

Chemically, ash is basic material having a reaction varying from pH7 to pH10, and is well supplied with lime. It is completely devoid of nitrogen but contains some potash. Phosphates, though present in small amounts, are not generally available to crops. Fertilizers must be used generously, but the quantity necessary will vary according to the depth of the soil covering. More is needed where the soil is thin than where it is thick. It must be noted that the bare fuel ash initially carries no form of life, so if, for example, legumes are to be grown an initial inoculation will be essential.

Crops

Plants vary in their response to ash characteristics, so only the crops most suitable should be grown. Grasses, clovers, lucerne, brassicas, sugar beet, red beet, spinach and rye are the most tolerant towards toxicity. Barley, potatoes, peas and beans are sensitive. It is therefore wise, especially where the soil is thin, to grass down for a period, the length of time probably depending on weather and percolation. During that time the ash near the surface will be weathered and the toxicity level will fall. Subsequently it may be possible to follow the grassland with arable crops. Where the soil cover is adequate most crops can be grown.

Grassland

A number of seeds mixtures have proved satisfactory. In the Midlands, cocksfoot, timothy and ryegrass have been generally successful. The following mixtures are recommended:

ON ASH WITH A SOIL COVER

(a) Grazing Mixture (lb per acre)

6	S.24 Perennial ryegrass
6	S.23 Perennial ryegrass
6	S.48 Timothy
2	S.100 White clover
1	S.194 White clover

20½

(b) Mixture for Cutting (lb per acre)

8	S.26 Cocksfoot
8	S.37 Cocksfoot
6	S.48 Timothy
2	White clover

24

ON ASH WITH NO SOIL COVER

In those cases where soil is not available and it is necessary to get a cover to prevent the ash from blowing, a suitable temporary mixture is:

lb per acre

20	Italian ryegrass
10	either Sweet Clover or Lucerne (Du Puits)
1	Wild white clover

31

Sweet clover should not be used if stock are to be fed on the produce. All mixtures must be adequately fertilized and will respond well to subsequent nitrogen applications.

Adequate amounts of fertilizers are essential, and for a time they should be given in quantities at least 50 per cent in excess of those used on ordinary soils. Where there is little or no top soil the nitrogen dressings can be increased, but not beyond a point where the legumes will be suppressed. Because ash is alkaline, the first dressings of nitrogenous fertilizers should, if possible, be in the form of nitrate of soda or nitrate of lime. Failing these, ammonium-nitrate fertilizers such as Nitro-Chalk or Nitra-Shell may be



Harvesting wheat on pulverized fuel ash in the shadow of Connah's Quay Power Station

used, but in these cases some of the ammoniacal nitrogen may be lost. In the first year a dressing such as the following would be satisfactory (units per acre):

48 Nitrogen 108 Phosphate (P_2O_5) 60 Potash (where legumes are sown)

If a compound must be used, then at least part of the nitrogen present should be in the nitrate form. Where the soil layer is 6 inches thick or more no such considerations concerning the nature of the nitrogen need enter in; normal fertilizers can be used. Subsequently treatments on bare ash, of where the cover is thin, should be given if the plants appear pale or poor in growth.

Arable crops

It will not be normal practice to grow arable crops unless the toxicity of the ash is low or the soil cover sufficiently deep. In the former instance the choice must be made from the tolerant list given above; and adequate manuring, particularly with nitrogen, is absolutely necessary. In the latter case the manuring should be rather in excess of that usually given for the same crop on undisturbed land.

Livestock

A careful watch is being kept, but no adverse health problems have so far been observed in animals grazing on restored ash land. Even on grassland where no soil at all has been applied, no harmful effects have yet occurred.

Earlier articles by W. Morley Davies on agricultural restoration appeared in the following issues:

Opencast Coal March 1963 **Ironstone** April 1963 **Sand and Gravel** May 1963

13. The High Peak

W. R. B. Carter

UPLAND and hill have stamped their character on the farming in the Chapel-en-le-Frith district of Derbyshire, popularly known as the High Peak. Most of the district lies about the 1,000 ft contour, but Kinder Scout rises to 2,088 ft. Winter is often severe, with snow lying up to forty days during the year. Spring is usually rather late and autumn early, even when compared with places only 20 miles away.

The Pennine Chain, which rises in North Derbyshire and Staffordshire, passes northwards to the adjoining West Riding of Yorkshire. Much of the soil of the area is derived from the Millstone Grit and is of low natural fertility. Rainfall varies between 45 and 70 in. a year, and this, coupled with poor natural drainage, produces acid soils and often peat. Large tracts of both open and enclosed moorland, carrying bent, molinia, heather and cotton grass, provide true hill farming conditions.

An area of carboniferous limestone impinges on the Millstone Grit to the south-west of the district. Whilst the rainfall here is still high, the rock has good natural drainage and a better soil has evolved, but this, too, can be very acid. Soil depths are shallow and rock outcrops are frequent, as is emphasized by the miles of dry stone walling enclosing farms and fields throughout these parts. There is a very small area of coal measures towards the north-west, bordering Cheshire. Fertile valleys lie at the foot of some of the hills, often exhibiting boulder clay from the movements of glaciers.

The carboniferous limestone is highly pure, with the result that quarrying has become a very important industry; indeed, it is reputed that the I.C.I. quarry near Buxton is the largest of its kind in Europe. Less than 10 per cent of all the limestone produced, however, is used for agricultural purposes.

Hill farming has been best developed in the north-east part of the district, where milk production has gradually been abandoned by most farmers since the end of the war. Flocks of Swaledale and Dales-bred sheep are well established at the expense of the native breeds, the Woodland Whiteface and the Derbyshire Gritstone. But local breeds have stabilized their numbers in recent years, and perhaps the pendulum will swing yet again. The trend is towards larger flocks, and labour-saving handling pens and dippers are being installed on many farms. Nearby industries are serious competitors for farm labour but amalgamation and rearrangement of boundaries, plus attention to buildings, is helping the labour situation.

Productivity in sheep farming has risen noticeably during recent years by the introduction and use of vaccines against the clostridial group of soil-borne diseases such as pulpy kidney, blackleg and lamb dysentery.

Suckler herds of Galloway and Blue-Grey cows have been established, with a definite trend towards using a Hereford bull, and results at the local

suckler calf sale in Hope underline the value of this. Best prices are realized for well-grown, white-faced calves, and farmers are now tending towards calving their cows in late winter rather than early spring.

Even though the area of land used for hill farming is probably the greater, the chief enterprise in the district is still milk production. Historically, this developed from the demands of Manchester and Sheffield and was frequently based on a flying herd system. Conditions on these uplands are often far from congenial. Farms are relatively small, use family labour, and are frequently under-equipped and under-capitalized. Part-time farmers are slowly increasing in numbers, as opportunities for employment are afforded in nearby towns. The Small Farmer Scheme has been of great help in this area. Some 300 schemes have been carried out, and these have undoubtedly alleviated many hardships and enabled the younger farmers to get on more quickly than would otherwise have been the case. Stocking rates are quite high; farmers have learned the hard way that this affects their profits perhaps more than anything else. But feed costs are rather higher than in many areas—a reflection no doubt of the hard conditions.

The land is almost entirely in long-term grass, although forage crops have been grown successfully on a small scale. Nevertheless, grassland production leaves considerable room for improvement, fertilizer usage being amongst the lowest in the country. Most of these upland dairy farmers keep a small sheep flock, often to turn odd areas of rough grazing to good account; Cluns, Kerrys, Mashams and Cheviots are to be seen, but pure flocks are rare. Egg production, although small in scale, contributes significantly to the income of these farms and, since this is a holiday area, a high proportion of the eggs is sold at the farm gate.

Bounded as it is by large urban populations (half the population of England is said to live within a 50-mile radius), preservation of the High Peak countryside is now assured by its being designated the first National Park. Reminders of bygone days abound in monument and custom alike. In the early Middle Ages it was a Royal Hunting Forest, with its lodge at the historic Peveril Castle at Castleton. Well-dressing is a unique custom dating from the fifteenth century. It owes its origin to the thanksgiving of our ancestors for water, said to be a rather unpredictable commodity in those days and certainly a limitation to agricultural progress until very recent times. The winning of lead was practised by the Romans and became a major industry in the reign of King Charles I, whose laws often led to conflict between miners and farmers. Trees were lopped for smelting, until finally the forest disappeared. The small size of farm no doubt originates from the lead-miner, who treated farming as a means of subsistence and enclosed the natural moorland as he was able.

The preservation of the Peak District National Park provides a further amenity for the nearby cities of Sheffield, Nottingham, Derby and Leicester. The collection and storage of water to supply them is a major industry, and the surrounds of the main reservoirs—Ladybower, Howden and Derwent—have been afforested, Scots fir, larch and spruce lending an alpine appearance to the hills rising up from these artificial lakes. Wintry weather, which brings additional hazards to the farmers of the High Peak, serves to enhance this impression. But the shelter which such afforestation provides may be some compensation for the lack of natural benefits to agriculture.

B. D. COLDWELL.

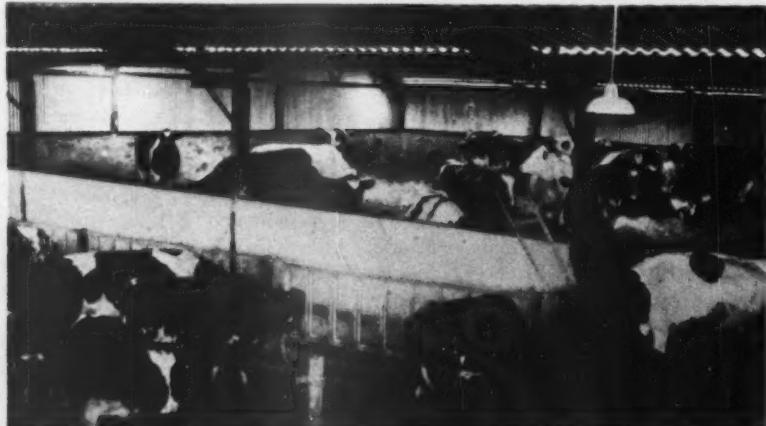
Agricultural Land Service, Shrewsbury

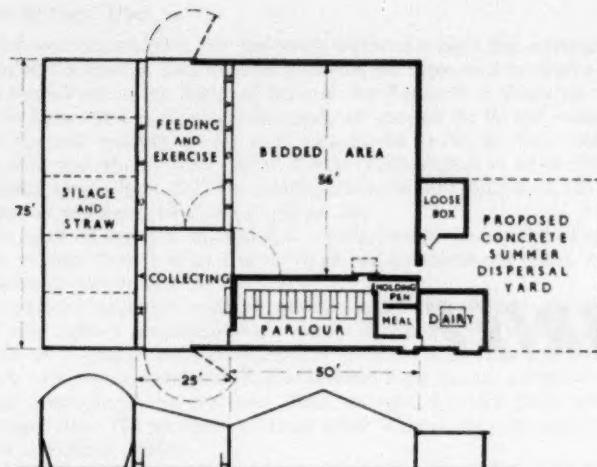
Planned for Milk

SOME three years ago, Mr. J. V. Longmore and Mr. K. C. Scarlett entered into partnership at Sundorne Grove Farm, Shrewsbury, a holding of 150 acres. At that time the herd of 42 dairy cows was housed in three cowhouses and batch-milked in two. This system necessarily involved expensive management. A covered yard and milking parlour was therefore decided upon to reduce labour costs in feeding, mucking out, milking and cleaning dairy equipment, as well as increasing the size of herd.

The buildings were planned to house 60 cows at 78 sq. ft each, and are capable of extension if required without alteration to the basic cycle of herd movement. The bedded area, parlour, meal store and holding pen are contained in a steel-framed, ridged-roof building, 75×50 ft, the walls to the bedded area being 9 in. massed concrete, 6 ft high, sheeted above with galvanized iron. The exercise and collecting yard are in a lean-to between the main building and an existing four-bay Dutch barn, which was extended by a further bay.

The bedded and feeding/exercise areas. The collecting area is to the right of the removable clapping post in the foreground





The Dutch barn houses the silage clamp, which has a capacity of 220-270 tons, plus about 50 tons of straw—adequate for the 60 cows under the present policy. Straw consumption, based on a winter season of 150 days, is approximately 14 cwt per cow. Silage is hand-fed in the feed-fenced mangers adjoining the barn and bedded area at the rate of 60 lb per day, together with 10 lb of hay—providing maintenance plus one gallon. If desired, the layout could be adapted to a self-feed silage system. Concentrates are fed in the parlour. The hoppers are hand filled at present but, as the plan indicates, the roof above the parlour allows ample room for storage and gravity feed chutes—a development which the farmers have in mind. The cows are held in the bedded area whilst the exercise area is cleaned and the mangers filled. They are collected in one section of the exercise yard, and the feed fence in that section is fitted with hinged wire mesh shutters to prevent feeding.

The parlour is a five-point, ten-abreast unit with pipeline direct to a bulk milk tank. The pipeline is automatically cleaned in about 25 minutes and the bulk tank in 15 minutes, which allows the operator to carry out other work at the same time. The entry and exit doors are controlled by pull-cords at the rear wall of the parlour. Milking time for two men is about 1 hour for the 60 cows with about 52 lb milk, as against 1 hour 40 minutes for two men milking 42 cows under the old system.

The total effect of these improvements has been to enable the two cowmen to manage 18 more dairy cows, a baby beef unit of 20 and an additional 750 poultry.

The gross cost of the buildings, including the loose box but excluding the silo, bulk milk tank and milking equipment, was £4,305 (i.e., £71 15s. per cow, and £47 16s. 8d. after allowing for grant aid).

An addition proposed for the near future is a concrete dispersal standing area for use during the 'out season'.

IN BRIEF

Sheep Handling

Few things are the subject of so much disagreement as the right kind of layout for a sheep handling yard. The simple truth is that there are many ways of achieving the aim which, fortunately, *is* agreed—that is, to design a yard which will put the sheep through quickly by the smallest number of handlers with the least possible exhaustion to them and the animals.

There are three main components: the assembly pen, the working area (crush, race, dipping and foot baths) and the holding pens. It is wrong to think of a yard as being suitable for a flock of so many ewes. The size of a yard should depend on the number of sheep to be handled *at one time*, and not on the number in the flock.

Thus first decide on the capacity of the assembly pen; from that follows the size of the holding pens. The working area is virtually a constant, being unaffected by the capacity of the assembly pen, except, possibly, for the dipping bath, which may be of the short-swim or long-swim type. But don't forget that with the eradication of scab in this country, the consequent relaxation of compulsory dipping regulations in some counties and the development of spraying, the importance of a bath is decreasing.

The shape of a site and management of the particular flock largely dictate the layout. Perhaps the most important principle is a complete circulation throughout the system so that sheep can be moved easily from one point to another. Quick movement is important, so the race should, if possible, point up-hill because, it is generally agreed, sheep run better up-hill. Some say that slope is irrelevant and that the important thing is that the sheep should run towards freedom and away from buildings; others say that as long as sheep can see a skyline they will run well. But, surely, both these alternatives very often mean that they will, in fact, be running up-hill towards the feeding grounds.

Where sheep have to pass one another, on each side of a fence, moving in opposite directions, the dividing fence should be solid. Gates into the assembly pen, and between the larger pens, should within reason be as wide as possible (say 10-12 ft) to allow quick flow and to act as sweeps. Elsewhere they should be as wide as the pens they serve will permit.

As to the old argument whether a race should provide for two-way or three-way drafting, some say the latter is easy; others (probably the majority) say it's too difficult—better to draft two ways and put the bunch through again.

Water in Pigs' Diet

Not infrequently we hear that too much water in a pig's diet adversely affects the quality of the carcass. Such a conclusion was not supported by results of an experiment carried out at the National Institute for Research in Dairying.

Here forty-eight individually-fed pigs, all around 40 lb live weight, were put under test and weighed weekly until slaughtered at 203 lb. They were trough-fed twice daily and allowed water either at a specified amount or *ad lib.* The daily meal allowance was 2½ lb at 50 lb live weight, which was increased by 0·2 lb every second day up to a maximum of 6½ lb per pig per day.

The result of this trial showed that a reduction in the amount of water allowed per lb of meal from 3 lb to 2 lb or 1½ lb had no significant effects on either performance or carcass quality.

An unrestricted water supply, in addition to the allowance of 1½ lb added to each lb of meal, gave a noticeable improvement in the rate of weight gain, due almost entirely to a greater meal consumption by these pigs. It is conceivable that the pattern of water consumption had influenced food intake, a little at a time when fancied throughout the day and night, as against twice daily allowance at a prescribed time. The provision of water *ad lib.* was not accompanied by any adverse effects on carcass quality.

The full experiment is reported in the October issue of *Animal Production* (Oliver and Boyd, 17s. 6d.).

Barn Dried Hay

A paper which Mr. S. Culpin, Director of the Drayton Experimental Husbandry Farm, read at the Nottingham Conference on the subject of 'Electricity and the Utilisation of Barn-dried Hay' is now available free in booklet form from the Electrical Development Association, 2 Savoy Hill, London, W.C.2.

Whilst the author recognizes that for some years ahead the practice of barn drying hay will still come third to field hay and silage-making, the experience at Drayton has pointers which every farmer should know about. Thus the comparative quality of barn hay, field hay and silage; dry matter losses over a number of years were 13 per cent for barn hay, 26 per cent for silage and 24 per cent for field hay.

Digestibility was also better in barn hay, and, when fed to fattening bullocks, showed higher liveweight gains than silage. The costs were also examined.

This paper is an excellent objective study of a fodder question which comes up for discussion more and more frequently.



*Batch baled hay drier
on a mixed farm in
Shropshire*

Drill Drill

Before taking corn drills into the field it's a good idea to spend a little time checking them over. Tighten up all the nuts, clean out the hopper and turn the feed mechanism by hand to make sure it's running freely.

If there is any doubt about the setting for a given seed rate, you can do your own calibration test; seed rates vary with the size and condition of seed and the manufacturer's figures are only approximate.

With the drill stationary, jack up the driving wheel clear of the ground and, with the drill in gear, turn the wheel the number of times needed for the drill to cover, say, one-tenth of an acre. Then weigh the quantity of seed delivered and multiply the total by 10 to give the weight per acre.

The number of turns of the wheel required for one-tenth acre is as follows:

$$\frac{484 \times 9}{\text{Sowing width of drill} \times \text{circumference of wheel}} \\ (\text{in ft}) \qquad \qquad \qquad (\text{in ft})$$

The sowing width of the drill is the distance between adjacent coulters multiplied by the number of coulters; for example, a 12-coulter drill with 7-in. spacing has a sowing width of 7 ft.

In a stationary test with a cup-feed drill, more seeds are left in the cups than when the drill is moving. Therefore a stationary test for this kind of drill may give a high reading.

When the sowing rate for a given setting has been determined, it is a good idea to record the setting and the corresponding seeding rate in paint on the inside of the lid of the drill box. Check the result of any calibration or reading obtained from a manufacturer's chart by noticing the quantity of seed used after an acre has been drilled.

Black Fen Experimental Husbandry Farm

To help solve special husbandry problems in the Black Fen area, a new experimental husbandry farm is to be established near Mepal, Cambridge, about six miles from Ely. This is the extremely generous gift of Alderman A. S. Rickwood, C.B.E., J.P., a well-known Fenland farmer, and will comprise a farm of about 150 acres. Mr. Rickwood has also undertaken to approach local farmers with a view to securing contributions towards the farm's development, on the understanding that a contribution will also be provided out of the funds available to the Ministry for its experimental husbandry farms.

The farm will be named 'The Arthur Rickwood Experimental Husbandry Farm'.

French Beans under Mobile Glass

Climbing French beans as a short-term crop in heated mobile glasshouses have been tried out at Stockbridge House E.H.F. They occupied the house (a Dutch light structure, 7 ft to gutters, 8½ ft to ridge) from March until the middle of July, after which time the house is needed to cover one or more crops of early-flowering chrysanthemums.

Of five varieties tried, Blue Lake, which is easily managed, found greatest favour and did best when the plants were spaced 12-18 in. apart in the rows and four rows per span were arranged in the same way as is standard for planting tomatoes in a Dutch light structure.

Details of the experiment are reported in the current issue (No. 10) of *Experimental Horticulture* (7s. from H.M.S.O.).



Crop Production in a Weed-free Environment. (*Symposium of the British Weed Control Council.*) Edited by WOODFORD. Blackwell Scientific Publications. 25s.

There are at present few crops, in either agriculture or horticulture, in which some means of chemical weed control cannot safely be employed. The continuing search for new herbicides and new applications make it likely that the time is not far distant when weed control by chemicals will supersede weed control by cultivation.

A symposium was organized by the British Weed Control Council with these thoughts in mind. Three papers review the situations in which herbicides are already reducing or eliminating the need for cultivation. Six are concerned with the physical requirements of crop growth and the consequences to the soil of not cultivating; the topics range from water acceptance and soil erosion to fertilizer availability. How much oxygen is required by the soil and the crop roots, and how compact can a soil become before root penetration and yields suffer?

The last three papers discuss the problem of the viable weed-seed population of the soil, the biological implications of soil aeration, and crop management under weed-free conditions. The first of these contends that in order rapidly to reduce the weed population of crops, all but the shallowest of cultivations are undesirable, in order to leave the majority of the seeds undistributed in the deeper soil. It is stressed that only few weeds would have to set seed to result in a large increase of the numbers in the surface soil. Thus a weed-free environment must not only be achieved, it must also be vigilantly maintained.

A final point of interest is that if herbicides can achieve and maintain weed-free conditions, conventional methods of growing root and vegetable crops, in rows, may give way to 'on-the-square' planting in much closer rows.

This publication makes interesting and stimulating reading, and is a useful addition

to the literature on weed control. The Council is to be congratulated for its foresight in organizing such a symposium.

W.E.

Perry Pears. University of Bristol. 42s.

It was a splendid idea to produce such an interesting, scholarly, but simply-written book on perry pears as a memorial to that fine man the late Professor B. T. P. Barker (formerly Director of Long Ashton Research Station). He was one of the founders of organized research in the orchard in this country, and it was his early struggles to initiate and extend experimentation that made all modern pomological research possible.

The book is, in essence, a brief story of the men who raised new varieties, took an interest in the management of orchards, studied the making of perry, and sought improvement in all those fields. It describes the varieties and orchards planted in the past, and makes detailed recommendations of the varieties to plant nowadays and of the arrangements of trees suitable for the production of good and plentiful fruit. The tangle of names is sorted out, the synonyms are listed, and there are drawings of fruits and photographs of trees. There is even a detailed key to the perry pears of Gloucestershire.

Reference is made to some of the diseases of the perry pear, particularly virus diseases, and to their influence on propagation methods, on behaviour in the orchard, and on cropping.

At the end of the book there are some beautiful colour plates of recommended varieties.

Perry Pears has the disadvantage that it is restricted to a fruit culture specialized in a small area. But it evinces the affection that most people have for the perry pear trees of Gloucestershire and the southern fringe of the West Midlands, and it will be of interest to every countryman. No one can predict the future of perry as a drink; but everyone loves the perry pear trees, and it will be a sad day if the last of these grand old orchards disappears through neglect or grubbing.

Many of the staff at Long Ashton have helped to produce this memorial, and the contributions are very good. Their efforts, and the expert editing, have produced a book that many whose lives are spent among fruit trees will be delighted to possess.

L.F.C.

The Shepherd's Guide. Farmers' Weekly.
Paperback 5s.

For a book that deals authoritatively with the general run of sheep problems, this is a modest title. It is the result of the skilful assembly of material by a group of informed writers—a happy blend of scientific fact and practical experience.

The theme is a calendar of flock management that gives answers to many husbandry problems, and a quick reference is possible through a detailed index. The layout is pleasant, and good diagrams and photographs support the text admirably.

For a few coppers more than the price of a pound of wool, *The Shepherd's Guide* is very good value indeed.

T.J.C.D.

and tribulations of farming. Seasons conform more or less to pattern, and weather happens at the right time. The 'wretchedness of waiting' and the 'agony of farming', though stressed, seem secondary to the main theme, in spite of the fact that the writer is directly involved.

'The personality of fields', 'The ritual of burning rubbish', 'Mysterious depths dark and potent', represent some of the poetry of the book.

As it must, hunting plays a great part. Whatever one's belief and leaning, there can be no objection to the author's complete enthusiasm. There is no deliberate attempt to condone or justify the sport.

This is a book about nature's rearguard battle against today: a book on Exmoor to be savoured by native or visitor alike.

T.E.W.

Living on Exmoor. HOPE L. BOURNE.
Galley Press. 30s.

*A world that has but turned the page
O'er the passing of an age.*

'How many people see the stars as I do? Not many in the modern world, I think. We have bartered our heritage for too many other things. Our lives are hemmed about with fetters of our own making and our souls caught in a web of our own weaving. Who shall set us free? I know not the answer.'

So writes Hope L. Bourne in her *Living on Exmoor*. With every sentence she continues to deny this theory, and confirms that for her part she has found an answer.

To identify oneself, to absorb and be so absorbed, to be continuously occupied in mind, in living, and in the living nature of Exmoor, must be escapism or fulfilment complete.

Her descriptive and depictive powers are well-matched. Detailed descriptions of the seasons show remarkable powers of observation and, to more than complete the picture, chapters are interspersed with the most exquisitely pencilled drawings.

Comprehensive, detailed and knowledgeable writing on nature is always interesting. The writer has added romance, nostalgia and imagination to a documentary on the Exmoor scenes and seasons. It is so refreshing to find a book not tied up with the complexities of human behaviour. Miss Bourne sticks to the simplicities of true nature. John Knight's pioneering farming efforts in his battle with Exmoor are mentioned incidentally, all sympathy being accorded to Exmoor's 'Sullen nature defiant against man'.

The compensations of living on Exmoor obviously more than make up for the trials

Economic Planning in Peasant Agriculture.
ERIC CLAYTON. Univ. of London. 7s. 6d.

It is now widely held that raising agricultural efficiency can contribute to the economic development of under-developed countries in a number of ways, for example, by increasing supplies of food, creating exports and by raising farm incomes which, in turn, stimulate demand for industrial products.

It follows from this that all ways and means of increasing the efficiency of agriculture in under-developed countries should be explored by administrators, economists and all those likely to be concerned with economic development. Mr. Clayton is well qualified to undertake this task in relation to the agriculture of Kenya, for he has spent several years in that country as economist to the Kenya Government.

The object of Mr. Clayton's study was to show how the productivity of a peasant agriculture could be increased by more economic combinations of farm resources and enterprises. Using the linear programming technique, he has computed maximum profit situations for a wide range of economic conditions for six holdings typical of the Nyeri District of Kenya. From these a number of useful conclusions and policy recommendations have been derived. For example, it is shown that, on the family farms studied, labour and not land was limiting increased production. Any attempts to raise the productivity of Kenyan agriculture depend to a considerable degree on the availability of hired labour. This is, of course, the reverse of the

situation in many under-developed countries, particularly in Asia, where land is scarce in relation to labour.

There is an interesting link with the United Kingdom concerning the division of interest between farmers and the industry over milk production. The maximum profit situations generally require a relatively large dairy enterprise. But from the industry point of view too much milk is being produced so that expansion should not be encouraged.

Even if one doubts whether peasant farmers are fully motivated by the objective of profit maximization, there is no doubt that Mr. Clayton's study is an interesting application of the linear programming technique, which has to date been devoted almost exclusively to solving the problems of the more complex agricultural economics of developed countries.

It is in this context that the monograph will interest readers in this country. But it should have a wider and more practical impact amongst administrators in Kenya and other under-developed countries, to whom the policy recommendations listed will be of especial interest. *B.H.D.*

While Some Trees Stand. GARTH CHRISTIAN. Newnes. 21s.

Seventeen years ago Garth Christian went to live in a cottage on the edge of Ashdown Forest, in the heart of the Sussex Weald. Since then he has made close friends with a wide range of men and women who draw their living from the land, and has learnt the ways of all the birds and beasts that haunt that still half-wild countryside. He has read, deeply, the works of our active modern school of naturalists and conservationists, and the old records which reveal our forefathers, even in Norman times, as keen and shrewd observers of wild life. All this study has now been packed into a book that makes most lively reading.

Garth Christian's main theme is that the wonderful range of creatures which delighted Gilbert White and his fellow eighteenth-century naturalists is fast disappearing. He gives an alarming list of causes, including tree felling, the use of toxic seed dressings, detergents in water-courses, myxomatosis, the spread of suburban buildings, and unscrupulous gamekeepers. Yet much remains—so far. The author can still write enthralling chapters—remarkable for their topical character and use of very recent information—on deer, squirrels, badgers, foxes and finches. The amazing spread of the grey

squirrel, for example, is matched by the surprising recent increase of the graceful roe deer in many of the Forestry Commission's new woodlands.

Outlining the farmer's sentiments very fairly, he never makes the mistake of thinking that all farmers hold the same opinion of any bird or beast. Although he believes that the bullfinch is our most beautiful small bird, he can still see why some fruit growers must shoot it, or face ruin.

Here is a book that not only entertains, but proves that natural history is still a living study, offering a fresh challenge for every observer.

H.L.E.

Fertilizer Technology and Usage. Edited by

M. H. McVICKAR, G. L. BRIDGER and L. B. NELSON. Soil Science Society of America. \$8.00.

Well-indexed, this 460-page book comprises thirteen chapters based on papers presented at a course held in 1962 at Purdue University, Lafayette, Indiana. This reviewed the many new developments in the manufacture and application of fertilizers that had taken place since 1950, when the Soil Science Society of America first sponsored a similar symposium.

The earlier papers appeared as *Fertilizer Technology and Resources*, edited by K. D. Jacob. The present volume is more broadly-based, for it covers plant/soil/fertilizer relationships and their bearing on the practical application of fertilizers, as well as the technology of fertilizer manufacture.

The twenty-seven contributors concentrate almost exclusively on United States research and development, and most of the numerous bibliographical references are to American journals. Nevertheless, the book will be an invaluable source of information for agronomists, advisers and teachers and students of agriculture as well as for fertilizer manufacturers.

For farmers, the chapter on how to apply basic economic rules to determine the most profitable use of fertilizers would be helpful in sorting out the various factors to be considered. But neither this chapter nor, indeed, the book as a whole could be regarded as light reading.

Three important chapters deal with recent researches into the interactions of plant and soil with the major plant nutrients, N, P and K. Emphasis is shifting from quantity of production per acre to crop quality, as biochemical studies throw more light on the links between plant composition and nutrient availability and uptake.

Secondary nutrients (calcium, magnesium and sulphur) and micronutrients (boron, manganese, chlorine, iron, molybdenum and zinc) assume a growing importance as the trend towards high analysis compound fertilizers lessens the amounts of plant nutrients, other than NPK, provided by these fertilizers.

Little information is given about the manufacture of the frits, chelates, metal ammonium compounds and humates recently developed to combat micronutrient deficiencies, but the diagnosis and control of these troubles in the United States is covered in detail. Liquid fertilizers receive surprisingly little mention.

Present knowledge on foliar application of fertilizers is reviewed critically—more and better-designed experiments are called for—and this chapter is notable for the number of references to research outside the United States.

S.L.

Wild Favours. EILEEN SOPER. Hutchinson. 25s.

Wild Favours is the fourth book in as many years derived from the pencil sketches and field notebooks of Eileen Soper, mainly of wild animals and birds. It completes a quartette of which any author-artist might be proud, for each successive work is that much richer than its predecessor, by no means an inevitable happening in such cases. In her first book (*When Badgers Wake*) she showed an enviable facility in getting to know and sketching the larger animals: foxes, hares and, above all, badgers.

In the very first chapter of *Wild Favours* the kittenish (rather than puppyish) antics of the fox-cubs prove that her touch is surer than ever; while, in the seventh chapter, *Smaller Fry*, some exquisite little drawings of shrews, voles and fieldmice reveal an equal intimacy with these tiner creatures. They are as near perfection as could be.

The second half of the book is devoted to birds: to the nuthatches, treecreepers, long-tailed and other tits, goldcrests and wrens, finches and warblers that forage and bathe and nest, and commonly feed from the hand, in the sanctuary of Eileen Soper's studio and garden. Page after page reveals hour after hour of closest observation—fascination to absorption—in the wild. But whether from personal sympathies or because birds are more volatile and, padded and clad in their feathers, less cooperative in disclosing their anatomy than are mammals, her sketches of them are not invariably as satisfying . . . yet! Some,

nevertheless, like the long-tailed tits on p. 179, or the sunbathing turtle-doves on p. 214, are first-rate.

Clearly, and to a high degree, this author possesses the twin attributes of a true field naturalist: the ability not merely to stop fidgetting and keep still, but that relaxation to the point of self-effacement that makes her just part of the landscape as far as most wild creatures are concerned; and the ability to set down what she sees or hears or smells, without on the one hand coldly scientific, or on the other anthropomorphic, frills. Such gifts are rare indeed, especially when communicated both by pencil and pen.

E.A.R.E.

The Bressingham Story. ALAN BLOOM. Faber and Faber. 30s.

In *The Bressingham Story*, Alan Bloom has set out to describe how he acquired a farm and built up a unique nursery business which has become probably the largest of its kind in the world.

He has achieved this with great clarity, describing in an absorbing, readable style, his efforts at drainage, land reclamation and various nursery operations.

But this is more than a book about a nursery. It could also be called Alan Bloom's 'Book of Life'. Throughout the narrative he has coupled descriptions of the hard work, mental and physical, of a nurseryman's life with a frank revelation of his personal struggle with a restless nature, always striving after perfection.

For all this practical outlook he is also a visionary. Despite his dogged determination to rebuild and expand his business, he had his moments of weakness and doubt. If he is candid and outspoken in describing his employees and others, he is equally frank in discussing his own domestic and personal problems. For instance, quite early on, in a moment of weakness, he yielded to impulse and ran away to Canada, returning only just in time to save the nursery.

Technically, the book is well produced and freely illustrated. There is some repetition, notably in relation to labour and finance, but this is excusable since these were subjects which were much on the author's mind.

In his final chapter he says that labour costs (in 1962) were still amounting to more than half the total expenses. He can be assured he is not alone in this; few, if any, growers' accounts examined in recent horticultural management investigations show labour items at much less than 50 per cent.

Despite what I have said, let no one think that the book is overshadowed by the discussion of morbid personal problems. *The Bressingham Story* is, in fact, one of great achievement. Packed full of interesting horticultural detail, it culminates with a description of how the unique display gardens were planned and made. As they contain between three and four thousand different species and varieties of hardy plants, it is small wonder that enthusiasts go in their thousands each summer to see them.

Anyone who has seen the nursery and the gardens will find the book absorbing reading. Equally, all who read about it for the first time will have a compelling urge to go and see the place (and if possible the author) for themselves.

To some, his collection of steam engines is now a strong rival attraction, but that is another, and maybe it will be the next, *Bressingham Story!*

R.W.K.

devote a large section of the report to considerations of barley marketing. Here, he very ably examines the need for improved market intelligence and the means of regulating supplies within Britain as well as dumping from abroad.

R.G.H.

Proceedings of the Second International Agricultural Aviation Congress. International Agricultural Aviation Centre. 50s.

This is a record of the proceedings of the Agricultural Aviation Congress held a year ago, written mainly in French. It provides a ready source of information on current developments in aviation as applied to agricultural production.

The papers cover a wide range of subjects. There are reports from most of the major food-producing countries, including a summary of aircraft usage in agriculture throughout the world. This, in itself, is a valuable piece of information that has long been required but, until now, has not been available in print.

Many sections will appeal to the specialist student, particularly the entomologist and pathologist concerned with developing control methods for pests and diseases. The enormous range of techniques now made possible by the use of aircraft are described. A lot of them are in the early development stages, but this does enable an assessment to be made of aircraft for the control of problems that are often difficult to approach with more traditional equipment. Particular sections which are fully treated include locust control and the employment of aircraft for vineyards. Some of the methods suggested may well prove effective in other plantation crops.

To both the specialist agricultural aviation student and the more general reader interested in the use of aircraft, this book will be of service. It should certainly find a place on the shelves of most agricultural college libraries, and it will have some value to the specialist in crop protection. It is a pity that the English summaries of some papers do not do justice to the full paper, and the reader would be well advised to consider the whole paper in the original language.

An index would have improved the book and made the search for information a little less exacting, but apart from these minor criticisms it is a useful contribution to a specialist but expanding field in agriculture.

R.F.N.

Barley Production Today—1962. C. J. BLACK. University of Leeds. 3s.

Barley growing today makes heavy demands on capital and light demands on labour. That is just one of the many facts which emerge from this economic survey, based on the second of two years' cost records from a sample of Yorkshire barley growers.

The report investigates possible economies in fixed and variable costs pertaining to current barley production. It considers the scope for further economies in seed rates and fertilizer usage on many of the farms. Grain storage methods are compared. It stresses the danger of investing too many resources in long-term grain storage projects to the neglect of short-term consideration. The balance between the two should be a major concern of management.

A study of contract harvesting on some of the farms indicates that grain growing can be profitable under conditions of capital shortage. Barley production, however, is examined in isolation. Information is lacking on the crop rotation practised and there is scant evidence of how barley growing fits into the general economy on these farms.

A check of any lowering of gross margins through economies in costs and expansion in output per acre is well within the reach of many barley growers, but the existing sharp and irregular fluctuations in the price of barley are of some concern to all. It is fitting, therefore, that the author should

Trade in Single-Suckled Calves. E. M. CARPENTER and K. DENT. University of Newcastle upon Tyne. 7s. 6d.

This report presents the results of what is primarily a study in marketing—the problems associated with the buying and selling of suckled calves bred in Northumberland.

Despite the solutions to all marketing problems freely and confidently expressed in the market-place, the conference hall and the agricultural press, there is a serious dearth of hard fact. The report is therefore doubly welcome, first for the information it provides about the auction mart system and second because, according to the authors, it is merely the beginning of an investigation which will ultimately examine 'the whole process of marketing beef'.

Does the auction mart provide an effective opportunity for free bargaining between buyer and seller? This is the basic question behind the inquiry, and the answer, based on records covering the sale of nearly 20,000 calves at seventeen different sales, is an almost unqualified 'Yes'.

Prices may be slightly lower at the beginning and end of the day; auctioneers' techniques may influence prices within narrow limits; a few individual lots may be sold at prices rather out of the general line; but 'these auctions provide a medium for remarkably accurate price discovery' and 'only if acceptable standardized grades for store stock could be adopted would any lower cost system of pricing be possible'.

Systems of management of the weaned calf after purchase vary so widely that the information collected from some forty buyers does not permit reliable comparisons of their relative profitability. By contrast, 391 questionnaires on suckler herd management completed by sellers, yielded a good deal of information of value to suckled calf producers. The effect of calving date, for example, on price and profit is well demonstrated. Chapter 4, 'Factors Influencing Value', and Chapter 6, 'Adjusting Farm Management Plans and Practices to Market Conditions', are well worth studying by those who are dissatisfied with the profits from their suckler herds.

J.R.J.

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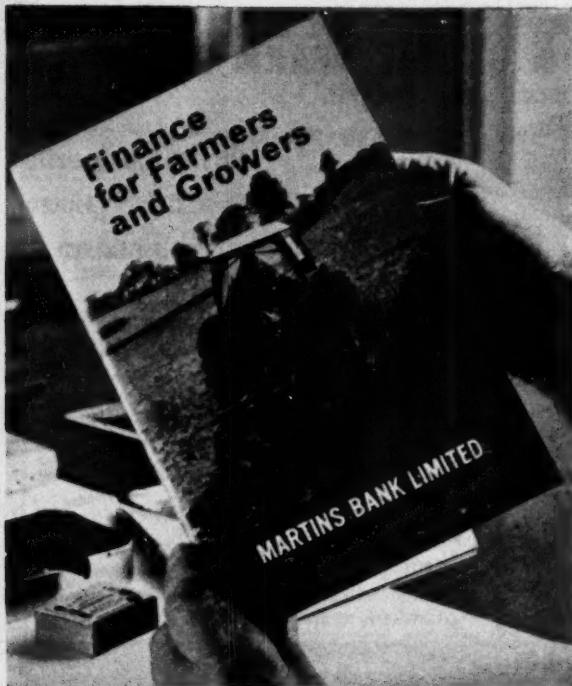
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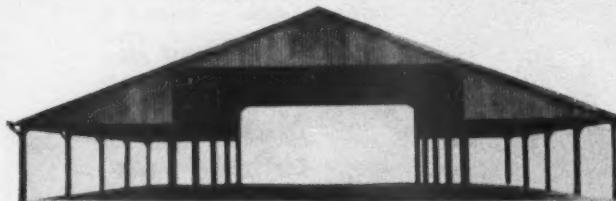
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Applications are invited for the above-mentioned newly-established Chairs within the Waite Agricultural Research Institute. Salary: £A4600 a year, with superannuation on the F.S.S.U. basis.

Potential candidates are invited to obtain from the Secretary, Association of Commonwealth Universities (Branch Office), Marlborough House, Pall Mall, London, S.W.1., or from the Registrar of the University a general statement about either Chair and formal terms of appointment. The University Calendar may be consulted in the library of any University which is a member of the Association of Commonwealth Universities.

Full particulars of the University's liberal Study Leave scheme and of arrangements available for house-purchase finance, and any further information desired, may be had on request to the Registrar.

Applications (in duplicate) giving the particulars listed in paragraph 5 of the Statement should reach the Registrar, The University of Adelaide, Adelaide, South Australia not later than 16th March, 1964.

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The University invites applications for two Lectureships or Senior Lectureships in Agronomy and Soil Science within the Faculty of Agricultural Science. The salary grades for Lecturers are Grade II £A1,800—100—£2,100, Grade I £A2,200—100—£2,600, Senior Lecturer £A2,750—100—£3,250. Appointment will be offered within these grades according to qualifications and experience.

Lecturer/Senior Lecturer in Soil Science

The creation of the position is Soil Science has been made possible by a grant from the Electrolytic Zinc Company, but it is a permanent position and the University has accepted the responsibility of maintaining it after the grant from the Company has been used.

Qualifications: Applicants must possess a degree in Agricultural Science, or in Science with Chemistry as a major subject. Post-graduate research experience in Soil Science is also required.

Duties: The appointee will be required to develop and teach a course in Soil Science to third year students in the Faculty, and may also be required to give portions of courses in other subjects such as Horticultural Science. He will be expected to develop a programme of research and to supervise postgraduate students.

Lecturer/Senior Lecturer in Agronomy

Qualifications: Applicants must possess a degree in Agricultural Science, and have had postgraduate research experience in some aspect of Agronomy.

Duties: The appointee will be required to develop and deliver a course in the ecology of plants of agricultural importance, and may also be required to give portions of other courses related to Agronomy. He will be expected to develop a programme of research and to supervise postgraduate students.

Further particulars and information as to the method of application should be obtained from the Secretary, Association of Commonwealth Universities (Branch Office), Marlborough House, Pall Mall, London, S.W.1.

Applications close in Australia and London on *31st March, 1964*.

University of Western Australia

RESEARCH FELLOWSHIP IN SOIL MICROBIOLOGY

Applications for appointment to the above-named Fellowship in the Department of Soil Science and Plant Nutrition in the Institute of Agriculture are invited from graduates in Science or Agricultural Science with postgraduate experience in microbiology. Preference may be given to candidates with a background of microbial chemistry and experience with the chemistry of bacterial cell walls would be an advantage.

The Research Fellow is to investigate a problem concerning the survival in soil of root nodule bacteria from one growing season to the next. He will be part of an active microbiological research group.

The Fellowship will be tenable for one year in the first instance and may be renewed for a second year.

The salary range for the Fellowship is £A1,500—£A2,000 p.a. The salary of the Fellow will be determined in accordance with qualifications and experience and an allowance will be made for or towards the cost of travelling expenses.

It is requested that intending applicants obtain details of the procedure to be followed in applying for the Fellowship and a copy of the conditions of appointment before submitting their applications. This information is available from the Secretary, Association of Commonwealth Universities (Branch Office), Marlborough House, Pall Mall, S.W.1.

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